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Smart Cities, Eco-Cities, and urban security.

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A te mamma,

che con la luce del tuo amore mi custodisci, illuminandomi.

Sei da sempre e sempre sarai il vento sotto le mie ali.

A te papà,

che con la tua quiete mi sostieni, offrendomi immense opportunità.

Sei da sempre e sempre sarai il motore del mio successo.

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Introduction

Climate change is not only depicted by researchers and experts as the world's greatest environmental peril, but it is also grasped as a security hazard that operates as both a "threat multiplier"[1] and a "catalyst for conflict". This definition stems from its potential to increase the incidence of political unrest and socio-economic disruption, which, in turn, is likely to lead to increased levels of armed conflict. Climate alterations are a driver of insecurity, displacement, and conflict over access to scarce resources, endangering inhabitants, stability of regions, entailing human and material costs, and inhibiting the state's ability to meet national priorities, promote sustainable development, and growth.

As the negative effects of climate change intersect with other factors regarding social, economic, and political conditions, they generate undesirable outcomes that transcend international borders and geographic areas of responsibility. Thus, since climate change is a problem looking for a solution, the crucial dilemma is how to act to address the roots of the disease and not merely curing the symptoms. In this line of reasoning, no desirable option could be defined as such if not considering security and safety as the cornerstones on which societies could benefit from sustainable development and resilience to climate change.

The thesis will investigate how security is a versatile concept that applies to various fields, pertains different referent objects, relates to dissimilar subjects and indicates measures to live free from dangers and fears, prevent, eliminate, or reduce serious damages, difficulties, and unpleasant events.

Solutions intertwined with a security insight can be provided at various levels: global, regional, national, and local. These dimensions are not mutually exclusive, rather they require collaboration and interaction to successfully fight climate change.

There is ample and clear scientific evidence that human activities have caused roughly 1.0°C of global warming above pre-industrial levels. Regrettably, if it continues to grow at the current rate, it is expected to reach 1.5°C between 2030 and 2050.

As stated before, there are various dangers to health and livelihoods, food and water security, human security, and economic growth consequential to an increase in global warming.

[1] Climate change was qualified as a "threat multiplier" in January 2019 by the UN Security Council's meeting on climate change.

Primarily, projected risks are expected to affect well-being and human health directly and indirectly. For instance, the emergence of high-mortality rate heat-related diseases, changes in air pollution and allergens, viruses, and vector-borne diseases (new or already existing but with an increase in their viral load and potentially able to expand their geographic range)[2] might not only compromise personal health but even threaten health infrastructures and occupation, causing further economic costs.

Food availability would decrease worldwide because of rising temperatures' negative effects on harvest seasons, livestock, quality of nutrition, and water reserves available for cultivation.

Global water stress is expected to increase due to alterations in precipitation patterns, high aridity rates, a decline in groundwater recharge, salt-water encroachment[3], and new toxins which may reduce accessibility to freshwater [4]. These consequences would negatively affect households and businesses, even impacting the energy sector.

According to the Intergovernmental Panel on Climate Change (IPCC), global warming will even intensify pressures over human security, namely

> "a condition that is met when the vital core of human lives is protected, and when people have the freedom and capacity to live with dignity. In the context of climate change, the vital core of human lives includes the universal and culturally specific, material and non-material elements necessary for people to act on behalf of their interests and to live with dignity"[5].

[2] Vector-borne diseases are caused by parasites, viruses and bacteria transmitted by vectors. They immensely affect the poorest populations living in tropical and subtropical areas and cause more than 700 000 deaths annually. Additional information can be found at the following link: https://www.who.int/news-room/fact-sheets/detail/vector-borne-diseases.

[3] Salt-water encroachment or intrusion is the displacement of surface water or groundwater by saltwater advancement due to its greater density.

[4] As stated by OECD. (2012). *OECD Environmental Outlook to 2050.* Paris: OECD Publishing, from https://doi.org/10.1787/9789264122246-en, and by IPCC. (2014). *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press, from https://www.ipcc.ch/report/ar5/wg3/ .

[5] This definition of human security is the one provided by the IPCC, 2018: Annex I: Glossary [Matthews, J.B.R. (ed.)]. In: *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. Retrieved March 19, 2021, from https://www.ipcc.ch/sr15/chapter/glossary/ .

Civil conflicts, mass displacement, and migration caused by extreme weather events[6] are expected to merge with higher poverty rates and vulnerabilities, which will be heavier on already disadvantaged strata of the population, indigenous groups, and communities reliant on agriculture or fishery.

A further loss is expected in biodiversity and ecosystems with accelerated erosion, extinction, or forced migration of certain species.

Fundamental is to understand that these modifications will undesirably disturb the land-based agricultural sector, forestry, fisheries, and the entire chain of the economy. For instance, concerning tourism, new and unexpected local climate conditions will make certain locations less or more attractive than others, generating new domestic and international tourist flows, and especially changes in their expenditures and relative local profits.

Consistently, the IPCC and the OECD reported that these trends and damages enhanced by climate change "result in higher costs to the economy relative to a world without climate change", where "costs to the economy" mainly refer to GDP losses. Without intervention, by 2030 around the world almost 4 trillion dollars in accumulated costs are at risk from climate change[7]. The potential global loss is reckoned to be US$9,593.71 billion or roughly 3% of the 2100 world GDP for 3°C global warming, and US$23,149.18 billion for 4°C[8].

Practically speaking, the world's economies will progressively suffer in terms of *(i)* impacts on physical capital, namely houses, factories, transport, communication, energy infrastructures, machinery, and digital devices, *(ii)* natural resources, as arable or building land, and *(iii)* labour, not to mention backwardness and hurdles those economies not fully recovered from the macroeconomic costs of climate-related destruction will face.

Global warming's effects vary by region, time, and economic sectors, but even if they are expected to worsen in poor Asian and African nations, no area of the world seems to be a safe zone.

[6] By extreme weather events we refer to events that rarely occur at a particular place and time of year. Generally speaking, a weather event would be classified as extreme if it as rare as or rarer than the 10th or 90th percentile of a probability density function estimated from observations, as it is specified in the document cited in the note above.

[7] As it emerges from Mercer. (2011). *Climate Change Scenarios – Implications for Strategic Asset Allocation.* IFC, Carbon Trust.

[8] According to the study Kompas, T., Pham, V. H., & Che, T. N. (2018). The effects of climate change on GDP by country and the global economic gains from complying with the Paris climate accord. *Earth's Future*, *6*(8), 1153-1173, these numbers are computed by using the value of GDP in 2017 from IMF (2018) as the base year.

As the IPCC's Fifth Assessment Report in 2014[9] confirmed, human influence is at the basis of the climate system's alterations. The current anthropogenic emissions of Green House Gasses (GHGs) are the highest in history and have already impacted human and ecological systems, therefore scientific reasoning asserts that climate change will intensify if we do not take drastic steps over the next years to counteract it.

Once understood what elements and circumstances exposed to climate change cause negative security outcomes and that climate change is a global and long-term phenomenon, the challenge for analysts, policymakers, and security experts is to elaborate a forward-looking policy approach to avoid – or at least diminish – those risks.

Expected and legitimate policy responses to climate change must harmoniously integrate strategies deriving from the field of environment, economy, energy, private businesses, education, and, above all, security.

Following this assertion, within the narrative of this thesis, it will emerge that comprehensive policies to address climate change and its security implications are more likely to be conceived, implemented, and monitored at the local level, even if the international arena offers valuable inputs.

Indeed, local decision-making and execution of policies have the added value of shaping the intervention consistently with the main features and necessities of the surrounding environment and inhabitants, approaching and giving voice to those personally involved, and better managing the budget and the expertise needed for the positive outcome of the policies themselves.

Henceforth, references to the *local level* will pertain to a specific area of governance, namely the urban one.

Cities are recognized as major contributors to climate change. Despite accounting for less than 2% of the Earth's surface, they consume 78% of the world's energy and produce more than 60% of GHGs emissions[10].

On the report of the IPCC, to limit global warming to 1.5°C "rapid and far-reaching transitions in uses of energy, land, urban, and infrastructures (including transport and buildings), and industrial systems" are indispensable.

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[9] IPCC, Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: *Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press, available at https://www.ipcc.ch/report/ar5/wg2/ .

[10] According to UN Habitat data, available at https://www.unep.org/explore-topics/resource-efficiency/what-we-do/cities/cities-and-climate-change .

The *2018 Revision of World Urbanization Prospects* presented by the Population Division of the UN Department of Economic and Social Affairs (UN DESA) notes that by 2050 2.5 billion people will reside in urban areas[11]. Therefore, as the world continues to urbanise and cities are subject to extreme climate change consequences, successful management of urban growth is key to safe and sustainable development, implying that cities must be recognized as pivotal actors taking part in the fighting against climate change.

Accordingly, our urban decision-makers and city dwellers are engaged in the dynamic of "strategic urbanism"[12] and are therefore pursuing wide urban agendas to enhance the benefits of urbanism while managing wide urban population growth's demands[13] and climate hazards, within the framework of security and sustainability.

This thesis will filter climate change and proactive urban responses through the lenses of security, as researchers are exponentially contemplating cities as composite systems and are committed to developing innovative methods to secure and improve their key strengths, namely resilience and the natural, human, physical, and economic capital.

In this strive, new urban models balancing social, economic, and security standards in an integrated way recently emerged under the name of Smart Cities and Eco-Cities. Hence, the thesis' aim will assess the primary role of these two prototypes in shaping a new paradigm of urban security meanwhile locally contrasting climate change and the insecurity that derives from it through proactive policies and modern practices.

To do so, the paper will be divided into four chapters.

The first one will introduce the link between climate change, environment, sustainability, and cities, within a framework of security. Forasmuch as climate change is acknowledged as a security issue, the further move is to deal with it through progressive security discourses to encourage the emergence of practical models – as Smart Cities and Eco-Cities seems to be – to counteract climate change and other forms of vulnerability, which in this dissertation pertain cities.

[11] Close to 90% of them in Asia and Africa. Information are available at https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html .

[12] The concept of strategic urbanism refers to the urban strategic planning, an innovative instrument of management enhancing partnerships between public authorities and civil society to design and oversee sustainable projects for the city. With reference to this, it is possible to check the Commission on Urban Strategic Planning Policy Paper on Strategic Urban Development, available at https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiJop-r2-vvAhWDq6QKHd5OD64QFjADegQICRAD&url=https%3A%2F%2Fwww.uclg.org%2Fsites%2Fdefault%2Ffiles%2FEN_525_draftpolicypapermonica2504.pdf&usg=AOvVaw2vmRQBdZr1qiisi_jscUEP .

[13] Personal and collective safety, housing, transportation, health care, energy, education, employment.

Consequently, advocating for a security narrative on climate change requires political, societal, and economic mobilisation to re-design cities in the logic of smartness and sustainability, to finally meet the need emerged with the Anthropocene to live in a balanced and safe way. To explore these concepts, notions of urban ecological security, sustainable common security, and security-based urban planning will emerge, so as to prepare the stage for a broader discourse focused on urban security, which will be the main theme of the next chapter.

Specifically, the second chapter will deal with this general concept of urban security, which refers to numerous forms of crime and vulnerabilities that local authorities need to contrast. Then, the integrated management of urban security policies established by the Italian law will be highlighted to reflect on how they could be enhanced, improved, and implemented more efficiently through Smart Cities and Eco-Cities.

The third chapter will introduce Smart Cities and their positive and negative security implications, reasoning on how the use of integrated ICT can improve urban safety – by enhancing transparency and emergency responses – and considering risks and challenges of Smart Cities, as data security and data privacy leakages, availability, management and storage of data, cyber issues and cyberattacks.

Afterward, in chapter four the other topic of the dissertation, that is Eco-Cities, will be analysed following the previous approach. It will propose Eco-Cities as models able to enhance the resilience of metropolises in economic, societal, and environmental security terms. It will illustrate their innovative techniques that are ameliorating and guaranteeing food, water, and health security to boost the overall urban and citizens' conditions while noticing resulting vulnerabilities.

Lastly, the thesis' conclusions will summarise the main concepts that emerged and, consistently with the research question, it will reason over the possibility to consider Smart Cities and Eco-Cities as new viable models of security at the urban level since they offer an innovative sustainable alternative to the urban environment as we know it.

Throughout the entire structure of the thesis, insights about policy advice and best practices will be provided.

Chapter 1: Connections between climate change, security, and the urban level

1.1 Climate change as a security issue

The link between peace, human welfare, and environmental protection has been codified in June 1992 at the Rio Declaration on Environment and Development.

According to Principle 25 of the Convention, "Peace, development and environmental protection are interdependent and indivisible"[14]. This leads to the concept of environmental security, impossible to be understood without insights from peace, security, and natural resource studies.

Security is a versatile word and concept, which applies to various fields and relates to different subjects. Its etymology derives from the Latin *sine cura*, and it means unworried. It refers to a condition free from dangers and fears, or to actions that prevent, eliminate, or reduce serious damages, difficulties, and unpleasant events. It pertains to different referent objects as human beings, investments, nations, and the international community; and it deals with diverse risks and threats, be they natural disasters, ordinary crimes, human trafficking, terrorism, or military invasion.

Environmental change effects, intended as the human-induced global short- and long-term phenomenon of alterations in the usual climate of the Earth, can be considered as a security issue threatening ecosystems' sustainability, global economy's stability, and mankind's peace and future. Therefore, by recognizing these individual and national's vulnerabilities, the concept of environmental security emerged, intended as the capability to secure well-being by adapting, mitigating, or avoiding climate change's negative consequences. Conversely, the exposure and inability to adapt or contrast the hazardous effects of climate change define the opposite condition, namely environmental insecurity.

As the fifth Annual Report of the IPCC (2014) asserted, the impact of climate change on human wellbeing, peace and security will worsen, being harsher on the poorest member of society and in under-developed regions where governance, political stability, resource, and infrastructure management are lagging.

Inevitably, these conditions provide fertile land for security challenges, thus manifesting a nexus between threats and climate. This link explicitly leads to the recognition of climate change as a

[14] The Report of the United Nations Conference on Environment and Development signed in Rio de Janeiro can be consulted from https://digitallibrary.un.org/record/168679 .

security concern and makes researchers, experts, decision-makers, and citizens discuss it as a security concern.

This connection between climate variations and security should be welcomed as propaedeutic to define priorities and urgencies related to the subject. Indeed, by doing this, it is possible to legitimately shape the political agenda and elaborate ensuing policies at the local, national, and global levels.

The association climate change – security issue is quite recent, as it was not before the mid-2000s that global concern over climate variations became widespread and influenced analysts' work. Consequently, scholars started to investigate the linkages between the phenomenon – climate change – and the condition – security – even to understand whether this would be *the issue* confronting present and future generations[15].

Inevitably, different views and considerations on the climate change – security relationship led to different security discourses.

While some of them focused on climate as a cause of conflicts and harm to the national security[16], others dealt with international stability and peace, whereas further perspectives targeted the challenges to livelihoods of vulnerable populations[17].

Regarding the latter focus, namely defining climate change as a human security threat, not only it converged the attention towards people, making them the key referent object of security, but it also accentuated the role and capabilities of states, sub-states groups, institutions, and civil society as legitimate providers of climate security.

As stated before, different viewpoints induced a plethora of diverse theoretical arguments that translated into several practical responses to climate change, and this is relevant in political and normative terms.

Just to offer an explanation:

(i) National security discourses favour adaptive measures enforced by the state to secure the sovereignty and integrity of nation-states from manifestations of climate change;

(ii) the human security perspective suggests a mitigation commitment (represented by a reduction in GHG emissions) to protect the welfare and resilience of the people. The

[15] As it is mentioned in McDonald, M. (2018). Climate change and security: Towards ecological security. *IT*, *10*, 153.
[16] For instance, Busby, J. W. (2007). *Climate change and national security*. Council on Foreign Relations.
[17] For example, O'Brien, K., & Barnett, J. (2013). Global environmental change and human security. *Annual Review of Environment and Resources*, *38*, 373-391.

authorities that should guide the definition and implementation of these new rules and practices should ideally be states, NGOs, and communities;

(iii) the international security and stability view recognizes climate change as an unsolved problem; therefore, it requires the international organizations' commitment to foster mitigation and adaptation strategies and counteract it.

1.2 Climate change and violence: the need for a thorough rethinking of security

As widely claimed by the literature, interactions between climate change, social, economic, and political inequities[18] result in violent conflicts.

Here the keyword is *interactions*, meaning that climate change is not the only causal variable triggering violence, but it is one factor that combined with others can increase the risk of violent conflict.

Furthermore, it is important to underline that physical hostility is more likely to outbreak within countries experiencing high levels of discrimination and unlawfulness, thus being unable to manage environmental degradation and its consequences, that may be, for example, less reliability on primary resources for income.

As it has been studied, environmental insecurity is related to direct violence in different ways, namely warfare, military activity even if in times of peace, and structural violence.

More in detail:

(i) A condition of warfare damages the natural environment and these casualties last longer than fighting[19].

(ii) In times of not-war, prolonged military training to prepare for new conflicts is another driver of environmental degradation due to the thoughtless use of land, airspace, waterways, energy, and other resources, not to mention the amount of waste produced by military departments and the difficulties of disposing of them properly[20].

[18] Intended as poverty, resource scarcity, weak democracy, high proliferation and civil availability of weapons, unemployment, immigration, poor health conditions, extreme weather events, and rivalries among communities.
[19] Defoliants and chemical weapons, burning of oil wells, use of uranium munitions, targeting nuclear implants and dams, and the release of harmful pathogens are just some of the numerous military techniques used during armed conflicts that cause environmental damages. In some cases, the use of these strategies and their consequential impacts on the environment and on people's lives is calculated and intended.
[20] It depends and varies on fuels, technologies, paints, solvents, and equipment tools required.

(iii) Direct violence heightens the levels of vulnerability of people, increasing the risks and difficulties individuals may have with dynamics such as climate change, thus leading to other forms of structural violence.

Structural violence, also known as indirect or institutionalized violence, is a term coined in peace studies[21] to refer to social circumstances, structures, and institutions that impede people to meet their basic needs. In other and simpler words, when power and resources are unequally distributed there is a high probability that structural violence emerges.

Unfair allocation of political freedoms, economic and social opportunities, transparency, and security contribute to individual and collective practices that may aggravate conditions of insecurity, increase pollution, and overuse of resources, thus expanding our carbon footprint. Moreover, if essential needs such as nutritious food, proper shelter, clean water, primary education, and basic healthcare are not met, people may opt for overconsumption of dangerous goods, illegal overexploitation of soil and harvesting, or resort to organized crime to obtain the support that the state formally guarantees but empirically does not.

The possibility to halt this vicious circle is the promotion of positive peace, intended as a change in the status quo to truly ensure an equitable distribution of freedoms and opportunities. More in detail, this concept opposes the structures and cultures of violence that induce people to behave violently. It is defined as an enduring form of peace resulting from sustainable investments in institutions, societal attitudes, and economic development, which are sectors that, if properly organized, nurture stability and wellness.

Furthermore, worth of mention is that positive peace is not a condition just for its own sake, rather its promotion calibrates society's resilience, intended as the ability to respond to external shocks without relapsing into violence and conflict.

Nonetheless, despite the important role played by positive peace in the reduction of structural violence, it cannot eradicate the entire risks that environmental degradation poses to human well-being. Indeed, until serious efforts are made to guarantee environmental security, events and practices

[21] Peace studies investigate the causes of armed conflicts, elaborate and promote strategies to prevent and solve war, terrorism, genocide, violations of human rights, and try to establish peaceful and fair societies. This field of research has an interdisciplinary nature, relying on political science, sociology, anthropology, philosophy, psychology, and other areas of study. Within peace studies, peace has been precisely defined. Under the label of "negative peace" it is defined as the absence of war; whereas "positive peace" refers to the concurrence of different conditions as access to food and clean water, education, guaranteed human rights, absence of risks and substantive lack of physical harm, and social, political, and economic balance to ensure a condition of fair, long-term, and sustainable peace. For further information, it is possible to refer to the Norwegian pioneer of peace research Galtung in his work: Johan Galtung, (1969). *Violence, peace and peace research*. Journal of Peace Research, 6, 167–191.

such as reduction in green areas, land degradation, biodiversity losses, risky resource management, pathogens, chemical and radioactive contaminations, pollution, abuse of fossil fuels, trade barriers, inadequate infrastructures, uncontrolled industrialization, and urbanization will continue to pose a risk to people living in developed and developing countries.

On behalf of these considerations, it is important to accentuate that peace, wellbeing, and environmental security are intertwined, meaning that they require comprehensive policies and strategies to be concurrently achieved.

This is in line with the theoretical concept of sustainable common security[22], according to which it is fundamental and necessary to reorganize the idea of security and the means throughout which administer it.

The need to re-think security is mainly driven by people's desire to be subject to new security policies that are characterized by an enduring, shared, and sustainable perspective.

This approach would be useful in addressing the new risks of regional and global instability that are posed by climate change, rivalries over resources, marginalization of communities, and increasing militarization.

These challenges and human needs should be addressed with a collaborative attitude, bridging cooperation and alliances among different stakeholders to make the overall system in which we live functional and sustainable.

As a result, a holistic disposition towards risks deriving from climate change contributes to the making, implementation, and monitoring of policies and practices such as the use of *(i)* climate science[23] to assess risk vulnerability, *(ii)* climate mitigation and adaption strategies as means to achieve peace and stability, *(iii)* conflict prevention and humanitarian strategies considering the surrounding environment and its conditions[24].

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[22] Here referred to the work of Langille, H. P. (2016). Sustainable Common Security. *Mondial, Canada: World Federalists*.

[23] Climate science arose in the second half of the 20th century owing to the issue of anthropogenic climate change, despite it addresses wide, heterogeneous, and long-term questions about the climate system. It is a discipline dealing with the dynamics of the Earth and its atmospheric properties (humidity, temperature, interactions with the ocean, the biosphere, and the geosphere). It tries to explain how local, regional, and global climate is stable or unstable over time.

[24] Conflicts and man-induced disasters, as well as their recovery operations, condition the environment and pose risks or opportunities to human health, wellbeing, and security. Thus, adequate procedures considering the climate and the environment avoid additional suffering, vulnerability, displacement, and dependency on external help. This was demonstrated by the UNEP Post-Tsunami Recovery Activities 2004-2007 document, available at https://reliefweb.int/report/indonesia/unep-post-tsunami-recovery-activities-2004-2007.
The report claimed that absence of environmental attention in post-tsunami recovery programming (as contamination of groundwater, inadequate siting, and materials of housing) eroded the long-term resilience of communities and the sustainability of interventions.

By doing this, security policies would truly target the basic needs of single people, communities, and nations, finally addressing the challenges deriving from or exacerbated by climate change, thus not procrastinating over situations that if neglected would impose high costs and risks.

The path to follow is made of intersectional debates, a comprehensive understanding of the current reality, and shared commitment towards a paradigm shift, not only from a security perspective, but in broader terms.

1.3 A progressive security approach to climate change-related risks

Nowadays, debates over climate change and security continue, and as the need to find viable solutions to secure livelihood, wellbeing, economic interests, and global stability from climate change nefarious effects becomes compelling, we are obliged to encourage reflections and opinions over climate change and security that provide a *progressive* approach to the matter, an arrangement that should attack and try to solve the roots of the problem while taking care of its most disparate consequences[25].

Thus, a progressive approach might be the one offered by the ecological security perspective, which suggests drastically modify how we perceive the relationship between humans and the natural world to finally act in symbiosis with the ecosystem that hosts us and allows us to live.

The attention of this security approach towards ecosystem resilience merges with the respect of the rights and the needs of those who exist across time and space, calling for attention and support to the most impoverished areas and populations, future generations, and all the other living beings[26].

What this epitome advocate for is a mitigation action (to promptly reduce GHGs emissions), an adaption strategy (to conform to the unavoidable impacts of climate change), and an overall change

[25] In the field of security studies, the various perspectives and inferences tend to be, if not refined, in some cases overtaken by new theories and considerations after fifteen or twenty years. this process, which also happens in the economic, social, and political sciences, is determined by a natural evolution of thought and circumstances that leads some issues to acquire greater prominence and thus require greater attention. Changing the theoretical paradigm that guides the security approach is therefore a spontaneous and inevitable process, which coincides with the realization of the limits, application difficulties, and even the anachronism of previous paradigms, thus requiring new options, solutions, and visions.

[26] This overcomes the limits and restrictions that the focus of the human security discourse presents. Indeed, the latter focuses only on currently living human populations, failing to address pledges and accountability to future generations and other living beings. These considerations are stressed by McDonald, M. (2018). Climate change and security: Towards ecological security. *IT*, *10*, 153.

in people's consciousness, entailing an active role played by all those involved in polluting, as they are considered liable for damages and responsible to provide ecological security plans of action.

The ecological security discourse introduces a new perspective in terms of security and normative commitment, as it is hinged on the concept of ecosystem, rather than the environment. Indeed, while the former refers to harmonic beneficial and adverse interrelations between the natural world and the human one, the latter tends to separate these two spheres.

Nevertheless, as

> "human activities [became] so pervasive and profound in their consequences that they affect the Earth at a global scale in complex, interactive and accelerating ways; humans now have the capacity to alter the Earth System in ways that threaten the very processes and components, both biotic and abiotic, upon which humans depend"[27].

This awareness of the external environment connected and subject to human lives emerged in the modern era and it has been the object of numerous studies that gave way to the new idea and geological age of the Anthropocene[28].

In this epoch, mankind is involved in the dynamics and conditions of environmental change, and to this extent, even the perception of security varies.

According to the work of Pirages[29], ecological security endures when four interrelated dynamic equilibriums occur:

- *(i)* Between human populations at high rates of consumption and nature's capacity to offer resources and services;
- *(ii)* between human populations and pathogens;
- *(iii)* between human populations, plant and animal lives;
- *(iv)* amidst human populations.

Conversely, in cases of imbalances, insecurity would emerge.

However, this link between balance-security and imbalance-insecurity has been further analysed and some researchers criticized the overall concept of equilibrium/imbalance, as these conditions refer to

[27] Steffen, W., Grinevald, J., Crutzen, P., & McNeill, J. (2011). The Anthropocene: conceptual and historical perspectives. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, *369*(1938), 842-867, http://doi.org/10.1098/rsta.2010.0327 .

[28] Anthropocene is the formal term, adopted in August 2016 by the Working Group on the Anthropocene, to describe the contemporary epoch.

[29] Pirages, D., & Cousins, K. (2008). *From Resource Scarcity to Ecological Security Exploring New Limits to Growth*. Academic Foundation.

a potential return to previous geological eras, without accounting for the human's impact and the role played in shaping the change that led to the Anthropocene.

It is for that reason that authors as McDonald suggested that the generic concept of ecological security should be oriented towards ecosystem reliance, rather than to the preservation of balance.

To deal with ecosystems' resilience means to identify the numerous and different components of the ecosystem as interrelated structures able to sustain life across time and space, absorb changes and respond to them through adaption or evolution while maintaining stable their essential functions. These theoretical assumptions find ground in terms of security when it comes to considering the inevitable effects of climate change and man-related inputs in generating it: not simply adaption, but even understanding, resisting, mitigating, and avoiding measures to ensure survival and wellness.

Hence, in this huge scheme where ecosystem resilience meets the concept of ecological security, a new inclination towards innovative, proactive, reformist, and progressive measures to minimize the rate and seriousness of environmental change and degradation appears[30].

1.4 Urban governance, urban sustainability, and security-based planning as tools to increase security

In exploring the links between climate change and security and touching on the new concept of ecosystem security, fair attention must be given to governance and power.

In the face of a changing climate, valuable governance, equitable access to resources, and well-functioning institutions mediate conditions of insecurity and maintain adequate levels of the community's welfare.

Contrariwise, when required to counteract climate change and the dynamics that result from it, a state unable to ensure law, public order, welfare, the monopoly on the use of force, citizens' participation, and essential public services may suffer a crisis and intensify the risk of insecurity[31], as it is widely recognized that the danger of turmoil is incited by a community that perceives its state authorities as

[30] For further information, Corry, O. (2014). From defense to resilience: Environmental security beyond neo-liberalism. *International political sociology*, *8*(3), 256-274.
[31] Schilling, J. (2012). *On rains, raids and relations: a multimethod approach to climate change, vulnerability, adaptation and violent conflict in northern Africa and Kenya* (Doctoral dissertation, Universität Hamburg Hamburg).

unable to fulfil basic duties, thus infringing the "social contract"[32] by not meeting its original expectations[33].

Additionally, violating social trust in the framework of livelihood insecurity and resource scarcity exacerbates climate change's consequences among the most marginalized groups of the community, which are not entitled to any or enough safety nets.

Under this, "poverty, state fragility and a propensity to violent conflict make a vicious circle, full of negative feedback: each feeds on the other"[34].

The already stated factual assertion of the IPCC fifth Annual Report that "climate change puts both human security and human rights at risk" reveals that the human right to life, health, shelter, and food are endangered by the impacts of environmental change[35].

Thus, policymakers are required to constructively deal with the climate challenge from a security perspective, relying on *(i)* transparent and accountable systems of governance, *(ii)* flexible methods of resource management, *(iii)* symmetrical top-down and bottom-up tactics, *(iv)* specialists in violence prevention and conflict transformation, and *(v)* a wide picture that considers short- and long-terms effects over interlinked socio-cultural, political, and economic factors[36].

In this frame of reference, the ecological security discourse fits perfectly because it presents itself as the most desirable path to adopt to tackle the effects of climate change on security. However, although it has sharable ethical and practical foundations, it is not yet a well-established approach, its resonance among the most powerful actors in international politics is still marginal, and if truly embraced, it would require radical adjustments and changes in political, economic, and security management at

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[32] As it is mentioned in Kaplan, S. (2009). Identity in Fragile States: Social cohesion and state building. *Development, 52*(4), 466-472.
The social contract consists to citizens' adherence to rule of law and tax measures, in return for the state to provide basic needs, as it emerged from Smith, D., & Vivekananda, J. (2009). Climate change, conflict and fragility. *International Alert, London*.

[33] When parties engage in violence "it is frequently due to the lack of residual support or political legitimacy that the state experiences and to the breakdown of the normative ordering", as mentioned in Tremblay, R. C., Nikolenyi, C., & Otmar, L. (2003). Peace and conflict: Alternative strategies of governance and conflict resolution. *Journal of Comparative Policy Analysis: Research and Practice*, *5*(2-3), 125-148.

[34] Smith, D., & Vivekananda, J. (2009). Climate change, conflict and fragility. *International Alert, London*, page 10, available at https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwif57rswcPvAhXJ2qQKHcX8AyYQFjAAegQIAhAD&url=https%3A%2F%2Fwww.international-alert.org%2Fsites%2Fdefault%2Ffiles%2Fpublications%2FClimate_change_conflict_and_fragility_Nov09.pdf&usg=AOvVaw2Dvas3hW0XsWPo7jrPCK-9 .

[35] These considerations are also stated by Sacher, D., & Windfuhr, M. (2008). The debate on "water as a human right" and its implications for development assistance. In *Water Politics and Development Cooperation* (pp. 146-176). Springer, Berlin, Heidelberg.

[36] As suggested in Smith, D., & Vivekananda, J. (2007). *A climate of conflict: The links between climate change, peace and war*. International Alert.

the global, national, and local level that at least in the short-term would not coincide with an increase in profits[37].

Nonetheless, the growing salience of debates over climate change, transition to green economies, and the circular economy[38] creates an opportunity to reconsider and reflect on new strategies to enhance security in different sectors such as health, economy, food, water, energy, technologies, and human lives.

Therefore, the next step is to ignite a sense of belonging among communities, create global and local civil society mobilization, institutionalize the relationship between environment, sustainability, and security, so as to engage the practice of ecological security with the politics of security.

Indeed, existing narratives of security related to climate variations lack the necessary commitment to protect, promote, and secure the rights and needs of the future generations living in symbiosis with an animating, dynamic, and mutating environment.

Therefore, we need a new approach – and a political, social, and entrepreneurial class willing to encourage it – that releases security from short-term temporal limits and other restraints such as the reference to self-sufficient individuals, groups, species, and contexts, to embrace a more comprehensive and cross-sectional spirit.

On the back of Robyn Eckersley's opinion over the possibility to achieve a lasting solution to the ecological crisis,

> "it is only in those political communities in which an ecocentric sensibility is widely shared that there will be a general consensus in favour of the kinds of far-reaching, substantive reforms that will protect biological diversity and life-support systems"[39].

The ecocentric sensibility he refers to is a polity characterized by *(i)* a democratic legislature entailing a multi-level decision-making structure giving a wide margin of manoeuvre to local and regional

[37] Not necessarily economically intended.
[38] The notion of circular economy refers to a vision developed at a conceptual level and practically applicable through institutional, infrastructural, corporate, and social commitments that allow concrete steps towards an unprecedented political, cultural, and entrepreneurial change to be taken. The circular economy is defined as "a regenerative system in which resource input and waste, emission, and energy leakage are minimised by slowing, closing, and narrowing material and energy loops. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling". This definition derives from the work Geissdoerfer, M., Savaget, P., Bocken, N. M., & Hultink, E. J. (2017). The Circular Economy–A new sustainability paradigm?. *Journal of cleaner production*, *143*, 757-768 available at https://www.researchgate.net/publication/311776801_The_Circular_Economy_-_A_new_sustainability_paradigm
[39] Eckersley, R. (1992). *Environmentalism and political theory: Toward an ecocentric approach*. Suny Press. Available at https://books.google.it/books?id=KLr7Y-mQiRQC&printsec=frontcover&hl=it&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

bodies, *(ii)* shared economic and political power between and within local communities, and *(iii)* a strong and dynamic emancipatory culture.

As a result, this union of elements would end in

> "a fundamental reevaluation of human needs, technologies, and lifestyles in such a way as to minimize energy and resource consumption and minimize or eliminate pollution; and the provision of adequate compensation whenever ecological reforms are likely to produce inequitable consequences for certain social groups, classes, or nations"[40].

An urgent task is to produce an adequate and truthful flow of information to the general public on ecological security issues, demonstrating how new practices positively impact different fields, promoting and increasing the general level of the individual – and ecosystem – well-being. Progressively, by doing so, even the political debate would reinvigorate itself, reasoning and deliberating over the meaning and necessity of a security consideration towards long-term and sustainable safeness.

This sensibility could – and did – spark at the urban level, through two new models, Smart Cities and Eco-Cities, which, as the next chapters will explain, appear as excellent solutions providing policymakers with the above-mentioned conditions necessary to proactively address the negative consequences of climate change on security, without being dominated by its risks.

As the concepts of smart and sustainable cities became outstanding in the public debate scope, they immediately gained strength and relevance as promising responses to the challenges of sustainability at the urban level.

From here on out, references to the urban level are due to and justified by the fundamental role that studying the local dimension entails in security term, as the urban realities are associated with several social, economic, and environmental impacts including, to name a few, air and water pollution, land depletion, environmental degradation, GHGs emissions, unsustainable energy production, use, and dissipation, ineffective waste management, improper urban design and associated community fragmentation, social turmoil, problematic mobility, traffic congestion, ineffective availability of public goods, outdated infrastructures causing technical and physical problems, decrease in public safety and health services.

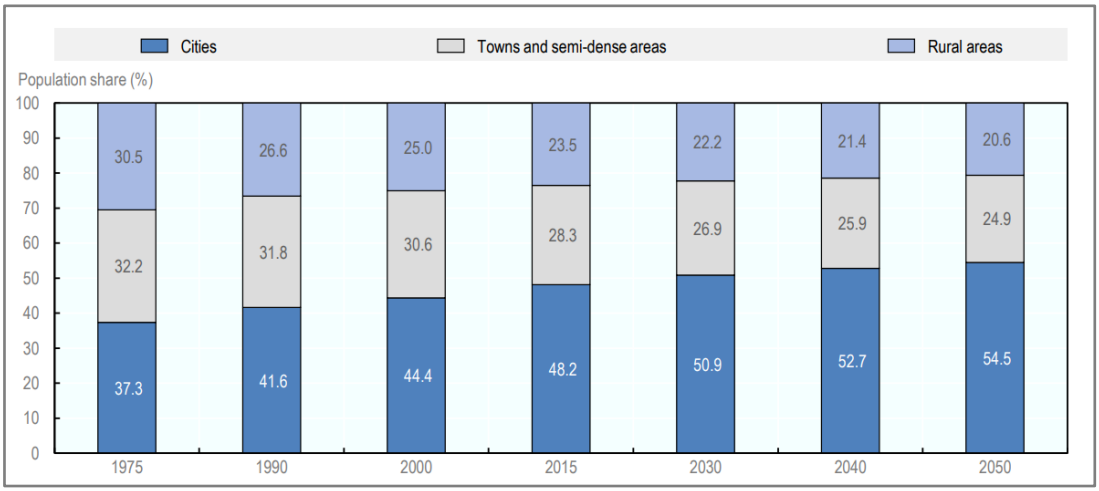
Without immediate intervention, this scenario is expected to worsen.

[40] See footnote 33.

When the United Nations was created only 750 million people were living in cities, so only 30% of the world's population was labelled as urban population. In 2008 the global urban dwellers outnumbered the rural ones, paving the way for the new urban millennium. Nowadays, among the 7.3 billion people of the world, half of them live in cities, even if this number is expected to rise to 60% by 2030.

The following graph shows how, in the future, the prospects indicate that the rural population will decrease.

Figure 1. World population shares by degree of urbanisation, 1975-2050.



Source: Florczyk, A. et al. (2019), GHSL Data Package 2019 (database), http://dx.doi.org/10.2760/06297; Jones, B. et al., Projecting Global Population Grids to 2100, Publications Office of the European Union.

If, at the moment, two-thirds of the world economy comes from cities, in 2030 this ratio will rise to over three-fourths, around 90 trillion dollars a year of economic output coming from cities across the world.

Cities are living systems that evolve and expand over time, according to their internal and external dynamics experienced in the short-, mid-, and long-run: flows of goods, people, information, energy, waste, and connections.

However, the expansion of the urban environment came at a huge price, as mentioned before, in terms of environmental impact, pollution, and other forms of unsustainable adversities. Additionally, knowing that millions of people across the world live in cities, it is mandatory to secure them from natural and man-induced disasters, as even the wealthiest and technologically most advanced cities are at risk.

Though, the bright side is that if we succeed in transforming most existing cities making them more sustainable and resilient, we could integrate disaster risk reduction, climate mitigation, climate

adaption, and urban development strategies to create new secure spaces flourishing with new economic opportunities.

This would positively transform the lives and livelihoods of current and future inhabitants of cities, and it lies at the heart of the well-known Sustainable Development Goals (SDGs) of the United Nations[41].

In September 2015, the UN provided a mandate to all governments "to make cities and human settlements inclusive, safe, resilient and sustainable", as the Goal 11 of the Agenda 2030 issued.

More precisely, what the SDGs require with Goal 11 is:

> "(11.1) By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums
> (11.2) By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons
> (11.3) By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries
> (11.4) Strengthen efforts to protect and safeguard the world's cultural and natural heritage
> (11.5) By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations
> (11.6) By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management
> (11.7) By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities
> (11.a) Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning
> (11.b) By 2020, substantially increase the number of cities and human settlements adopting

[41] In 2015 the United Nations' Member States adopted the 2030 Agenda for Sustainable Development, which offers a model to pursue worldwide peace and prosperity. It entails the 17 Sustainable Development Goals, defined as a call for action where developed and developing countries are required to partner and implement solutions to meet these objectives.

and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels

(11.c) Support least developed countries, including through financial and technical assistance, in building sustainable and resilient buildings utilizing local materials"[42].

Among these objectives, those of greatest importance for the purposes of the thesis deal with "adequate, safe, and affordable housing and basic services"; "safe, affordable, accessible and sustainable transport systems"; the enhancement of "inclusive and sustainable urbanization"; the "capacity for participatory, integrated, and sustainable human settlement planning and management"; "reduction of deaths and losses" caused by climate-related phenomena; the necessity to decrease the "adverse per capita environmental impact of cities" with attention to air quality and waste management; the provision of "universal access to safe, inclusive and accessible, green and public spaces"; the promotion of "economic, social and environmental links between urban, peri-urban and rural areas" for better-planning activities; and the creation of "integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change [and] resilience to disasters".

Coherently with the UN Agenda 2030, most contemporary academic debates advocate for the essential and instrumental role of sustainability in urban planning, identified as a means to contrast the substantial problems of urbanization, a trend expected to grow in the years to come and to put under stress the urban system in according to people, buildings, infrastructure, and resources' safety.

Urban planning is the process of shaping and directing the use of land, urban environment, infrastructures, human services, and the related ecosystem to make the city more sustainable and attractive.

No city is planned and organized according to a unique purpose; therefore the final aim of urban planning is to draft, evaluate, and forecast a coordinated and standardized physical arrangement of the city and its underlying infrastructural systems, processes, functions, and services to maximize the quality of life and the economic development, optimizing the management of infrastructures and natural resources, and guaranteeing security in its different forms.

[42] All the SDG are available at the website https://sdgs.un.org/2030agenda .

Urban planning overlaps with urban design, a field composed of architecture, civil engineering, sustainable and strategic urbanism. It designs, shapes, and adjusts cities according to their physical structures and typologies, to increase the sustainability of urban living.

Given that it evokes connections between human establishments and the circular economy, artificial infrastructures and the environment, people and the ecosystem, economic growth and social equity, wellbeing and security, its objectives are to make city areas more attractive, functional, secure, and environmentally sustainable.

For urban problems difficult to be managed a viable solution must be a long-term innovative restructuring of the methods of urban planning and development, resulting in a paradigm change that connects several fields in the name of citizens' safety.

Indeed, Smart Cities and Eco-Cities affirmed themselves as architects of a fruitful liaison between individual citizens, communities, businesses, technology, and institutions – all different subjects bonded by a new pro-environment attitude that is also modifying how security is perceived and guaranteed.

Smart Cities and Eco-Cities manifested the importance of focusing on human communities, ecosystems, and representative institutions. Decisionmakers are required to accomplish people's needs by offering solutions, services, and goods consistent with the concept of sustainable development, which, as originally stated in the Brundtland Report of 1987, refers to the ability of the present generation to meet "the needs of the present without compromising the ability of future generations to meet their own needs"[43].

The concept of sustainable development is complementary to and intertwined with the one of sustainability.

Sustainability consolidated itself through the years as a large-scale thinking paradigm capable of guiding and shaping societal development through innovation, science, technology, economy, education, urban planning, policy, and politics, albeit today it must impact more on security through direct and indirect methods.

Precisely, given that sustainability studies coincide with the understanding of the challenges faced by society, they dispose of all the information necessary to take inclusive actions to reduce episodes of vulnerability and risks, echoing in long-term benefits to the majority of citizens.

[43] Report of the World Commission on Environment and Development: Our Common Future, 1987.

The proactive nature of sustainability's approaches stems from the comprehension that the linear paradigm of "production, consumption, disposal"[44] applied to the totality of spheres that influence our lives is dangerous and cannot endure, as it triggers environmental crises that worsen the already fragile social order in both developed and developing countries.

A society that is depleting resources, relying on intensive consumption, and harming the environment through hazardous substances and pollution will, in the short, medium, and long time, not be able to meet people's needs and ambitions, generating conditions of unease and insecurity.

Alternatively, to live in a world where society's habits – here intended as personal, firms, and policy's behaviours – do not sabotage the ecosystem appears as a viable and deserving option.

Consistently with this view, the principles of sustainability and sustainable development have been spread throughout the urban dimension since the early 1990s, leading to the emergence of the concepts of urban sustainability and sustainable urban development.

Urban sustainability aims at creating habitable, prosperous, and healthy human environments with minimal demand for resources and minimal impact on the environment. It can be classified into four categories, that are the structure, environment, economy, and equity detectable in the urban sphere.

The four of them are equal in importance, interdependent, and in synergy. They can be appreciated and reinforced in a long-term sustainable urban environment through linkages between policy design and planning, social and scientific examinations, institutionalized and organizational methods, technological innovation, and security assessment[45].

To achieve this goal, the scholarly community and all those involved in the field of sustainability, security, and urban planning should coordinate a cross-disciplinary integration of data, critical analysis, evaluations, and participatory decision-making.

Under this deployment of diverse local actors, factors, and resources, it is possible to pinpoint a fine weave synthesizing and connecting economy, society, politics, and culture within the broader framework of ecosystem resilience, which leads to new mindsets and ingenious infrastructures that enhance a condition of long-lasting urban security and well-being.

This final objective is recognized under the name of sustainable urban development, intended as the advancement, or re-development, of cities through a balance between *(i)* equity, *(ii)* better quality of

[44] The so called "linear economy", in contrast with the "circular economy".
[45] To draw on Eckersley, R. (1992). *Environmentalism and political theory: Toward an ecocentric approach*. Suny Press.

life, and *(iii)* the protection of the urban environment via a reduction in resources' demand and use, and a minimum impact on the environment, to lessen the burden of degradation yield to future generations[46].

Thanks to Smart Cities and Eco-Cities we no longer need to separate between environmental preservation and human profit- and wellbeing-driven needs, since their way of integrating new tools and services reduces vulnerabilities and conditions of insecurity that derive from the previous mindset[47].

Their practices target the totality of the community, holding the most marginalized classes of the population in high regard, and bearing in mind the aggregate effects of current practices over the wellness and wealth of future generations. By doing this, the security approach that emerges is one able to extend the range of threats and, when promptly identified, to intervene and neutralize, or at least minimize them.

Hence, it is possible to realize how through local decision making and implementation of new programs and guidelines, Smart Cities and Eco-Cities mobilize social and political action on climate change, requiring new perspectives on security – especially urban security – that can be achieved through bottom-up and top-down responses centred on the re-design of cities in the logic of smartness and sustainability attitudes.

These two urban projects try to reach ecological and widespread security by lowering GHG emissions and promoting a transition to low carbon economies and cities, consistently with the awareness that the Anthropocene induced: the rightful and sustainable processes for halting climate change worsening stem from ecological sensibility and the need to safeguard and consolidate ecosystem resilience over time.

In this context, it is legit to think about what type of security is provided to the communities that live in Smart Cities and Eco-Cities, and by doing this the security discourse acquires resonance for many different reasons.

The path towards urban development, re-development, and regeneration programs imposes reasoning over the core feature of security, as cities are social, political, and economic subjects.

[46] See footnote 37.
[47] Namely, to consider mankind and the ecosystem as separated dyad, non-communicating.

Considering the “ordinary” aspect of urban security, intended as public order, it must be taken into account as cities are, first and foremost, places to live in. However, in the event they become dangerous areas, the negative fallouts would resonate on different levels.

Something already experimented worldwide is that the extensive presence of marginalized communities and segmented levels of social cohesion, combined with low responsiveness of law enforcement, generate the perception – often exaggerated by the media – that crime and anti-social conducts are a pressing and pervasive problem.

This unavoidably fuels the rhetoric and policy of insecurity that blemish the idea of cities as safe places for a huge variety of activities, from living to business.

It is well-recognized that cities attract significant flows of investments, thus becoming policy instruments for lucrative activities that must be secured from risks. If it is not the case, a city considered insecure would be perceived as unattractive and unable to offer the competitive environment that growth-oriented public and private policy agendas look for.

Nevertheless, it is also necessary to look at the other side of the coin, the one that offers development opportunities thanks to a new combination – albeit not entirely free of criticalities – between security and technological innovation.

As new burgeoning technologies were invented, they immediately started to be implemented in the security industry to facilitate the achievement of security tasks. Not only the ‘simple’ systems of video surveillance facilitated the monitoring and investigating activities of police agents in public and private places, but also these new high-tech tools became pivotal components of security and urban planning, offering defensible spaces within cities.

From these perspectives, the consideration of security in new city models induces further attention towards the way in which social interactions are re-structured and how public spaces, urban practices, and social order are related.

Recently, environmental planning and urban design started to be seen as tools to create new safe spaces or to secure those already existing. Therefore, urban safety planning was put in the spotlight, directing the relationships between different urban components, supporting connections between the urban space, economy, and society, as well as safeguarding citizens from safety hazards.

Therefore, it is evident that to provide this service, namely security within the city, technology plays an important role, as much as the urban culture, tradition, history, and the inhabitants’ behaviours, psychology, and connection with the city.

What is crucial, however, is the provision of a sense of general urban safety that cannot be perceived only with regard to the buildings' safety design and their disaster-prevention plan (e.g., the routes to follow to escape from an earthquake or a fire).

The real challenge is indeed to offer a comprehensive and safe public space system, controlled and *en régle*, with a well-organized administrative structure and a mediatic system that orients and supervises the flow of information to offer truthful news.

In practical terms, an urban design based on public safety aspires, among the other things, to provide the right means and infrastructures to increase the city's defence capability[48] from situations of destruction and attack, enhance hygienic conditions to alleviate health and pandemic disasters, build, position, or re-position in strategic locations police headquarters, firefighting facilities, and hospitals.

When merging security and urban design, thus producing the safety-based urban design discipline, all the security issues that revolve around a city find a physical space in which being addressed, as local authorities and local law enforcement agencies are required to set principles, strategies, and methods for urban space safety, offering plans for disaster prevention, reduction, safety, refuge, and defence.

When it comes to deal with people's safety in the urban environment, a security-based city planning must beware of several factors[49], which are psychological safety, behavioural safety, defence for safety, and safety against disasters.

Analysing the four of them with more attention, the following considerations emerge:

(i) Psychological safety.

As people's feeling of safety derives from lack of perceived threats, the urban environment shall offer the physical conditions to carry out a plethora of ordinary activities without the risk of external interferences, be they crimes, natural disasters, or terrorist attacks.

An urban scenario consisting of old buildings, lack of public spaces for physical aggregation, large and congested roads, dirty and polluted slums, and uncivilized manners is more likely to instil a feeble sense of control over the surroundings and social order, thus compromising the psychological perception of security of people.

Another consideration related to modern cities and societies is that nowadays the majority of factors that influence people's psychological sense of security are related to individual

[48] Thus, establishing a precise city form, road organization, and placement of walls, firewalls, water systems, and gates.
[49] According to Cai, K., & Wang, J. (2009). *Urban design based on public safety—Discussion on safety-based urban design*. Frontiers of Architecture and Civil Engineering in China, *3*(2), 219-227.

privacy. Therefore, in contemporary cities and even more so in Smart Cities, the security-based planning approach must reason over the limits and gains of Information and Communication Technologies (ICT) and their effects on the sense of security.

(ii) Behavioural safety.

Zero risk does not exist, not in the local scale, neither in the global one, not in individuals' lives, neither in the communitarian scope. Nonetheless, in cities, some conformations of public spaces may cause harm, or additional harm, to people involved in daily activities. Lack of lighting, excessively smooth surfaces, or streets full of chuckholes that create differences in height, watersides without handrails, and pedestrian routes not effectively separated or secured from vehicles' road systems endanger behavioural safety.

Therefore, security-based urban planning is required to resort to environmental behavioural science, ergonomics, and the added value offered by technology in order to prevent potential accidents that may occur in public areas and that would decrease people's perception of security.

(iii) Defence for safety.

The design of urban physical spaces must be consistent with the objectives of crime prevention, control, and defence. From the 1970s onwards it has been significantly studied and demonstrated that Crime Prevention Through Environmental Design[50] is an excellent strategy to reduce and eliminate crimes in cities.

Then, after the 9/11 terrorist attack, all over the world systematic research in urban planning started to focus on terrorist attacks' prevention strategies, generating concrete transformations in the urban environment, with the creation of safety buffer areas and new physical barriers composed of parterres and streetlamps, removing or interrupting streets that could be used by terrorists, and exponentially incrementing control and monitoring of city's areas[51].

Therefore, to obtain the safe management and maintenance of urban areas, protect citizens, and increase the possibility to identify, prevent, and promptly intervene against crime and terrorist attacks, integrating architectural layouts, public areas' structures, environmental

[50] A concept elaborated by the American criminologist Jeffery, whose studied the linkages between interpersonal relationships, criminal attitudes, and surrounding spaces.

[51] These are some of the safety-based urban design measures implemented in the United States from October 2002 to November 2004 on behalf of the National Capital Urban Design and Security Plan.

facilities, and technology within the perspective of security is the most suitable starting point.

(iv) Safety against disasters.

It is well recognized that cities are related to natural disasters. Urbanization and the functioning itself of cities are not sustainable processes unless there is an expressed desire to embrace the paradigm of urban sustainability through, for example, Eco-Cities.

In ordinary circumstances, cities have an adverse impact on the ecosystem, amplifying the risks of natural damages and all the consequential vulnerabilities that affect citizens' safety. Nonetheless, a proper urban design might overrule this calamity, as city spaces might be requalified in the name of disaster prevention and mitigation.

Doing so means addressing the notion of environmental and ecosystem security, trying to balance human life with natural resources and dynamics.

Just to make some examples, the promotion of the circular economy, formation of fire isolation belts and decentralized disaster-prevention areas, development of refugee spaces and rescue roads, provision of enough distance among buildings, and the use of materials legally guaranteed are techniques to increase the resistance of the urban environment to natural disasters.

Consistently with these matters, urban safety appears to be the unavoidable element guaranteeing urban survival and development.

Its rationale is to ensure the coexistence of human activities and mobility in public spaces, maximizing the perception of sustainability and security, limiting, and avoiding hazardous social practices through law enforcement strategies of prevention and deterrence.

From this it is possible to infer that urban security planning should carried out via consideration of crime and prostitution rates, residence and coexistence of immigrants' communities and different ethnic groups, drug dealing, structural and infrastructural decay, poverty, and socioeconomic exclusion.

Moreover, in urban security terms, the safety in a city, as well as police effectiveness, vigilance, and preparedness, depend on a punctual decision-making strategy that operates on behalf of the most suitable combination of technological tools (e.g., sensors, barriers, video surveillance), professional skills, and biological means (as trained animals).

Security operators must be ready to respond both to internal and external threats. While the formers are exemplified by social unrest, robberies, thefts, and vandalism; the latter include, to name a few, climate-driven disasters, and global epidemics.

A further consideration is that the extended monitoring of civilians' activities in public areas induces individuals to behave properly, consequently reducing events of misconduct that pose urban threats and inducing a sense of security that enhances the feeling of attachment and belonging to certain urban realities.

Yet, security measures not only are fundamental in the establishment and maintenance of urban order, but they also pose a burden over the urban lifestyle, as they raise the question of monitoring's limits and conditions. They impact civil and personal freedoms, and they entail expensive costs that the population has to endure.

Nonetheless, these pricey security measures are worthy of being born as they respond to various needs such as healthcare, efficient logistic, contrasting crime, and monitoring the quality of the environment[52], thus acquiring the notion of "sustainable" investments and practices.

Indeed, securing streets and other urban areas, managing diversity, and reducing risks of social inequalities, as well as making city's areas perceived as safe through serious and innovative urban planning activities, results in creating safe and inclusive zones that support individual and communitarian development, thus guaranteeing the overall flourishing of the community itself.

Given that urban planning schemes have a role in generating or avoiding crime events, if "control becomes designed-in, embedded in the very structure of time, space and environment"[53] it will be possible to create citizens responsible for the security consequences of their actions on public and private spaces, and to achieve an urban area where an all-round security approach is granted.

Overcoming poor urban planning and ensuring synergy between the security urban agenda and the sustainability one is a way to reduce tensions among the actors of cities and foster sustainable urban development in a security framework, even because crime is carbon costly, meaning that it negatively impacts the environment[54], whereas crime control contributes to stable sustainable cities.

[52] As it underlined by Bugliarello, G. (2006). Urban sustainability: Dilemmas, challenges and paradigms. *Technology in society*, *28*(1-2), 19-26.
[53] Rose, N. (1999). *Powers of freedom: Reframing political thought*. Cambridge university press, page 251.
[54] As it emerges in Armitage, R., & Gamman, L. (2009). Sustainability via security: A new look. *Built Environment*, *35*(3), 297-301, crime leaves a significative carbon footprint when it comes to replacement of stolen and damaged property, maintenance and renovation of void homes and so on so forth.

Moreover, the combined effort of merging security and sustainability in the urban agenda produces positive outcomes as the urban environment is a continuous structure, where "the whole pattern of urban space is involved in the sense of civilised and safe existence"[55], a perception that has to be actualized through security-based urban design.

The relationship between security, safety, and sustainability of cities is a cross-cutting issue that characterizes our modern societies, as there is a growing dependency among different sectors, stakeholders, and dynamics such as industrialization, urbanization, aggressive competitivity, and progressive technological development.

A relationship of dependency refers to a connection between different entities in society – be they sectors, infrastructures, goods, stakeholders – to the extent that the status of one influences the status of the other. By doing so, positive and negative cascade events occur, as well as the effects of policies and practices manifest in an intertwined manner.

The increase of dependencies in our modern societies is generally driven by three different processes: optimization, increasing competitive environment, and institutional fragmentation.

The three of them pose new challenges for security and sustainability.

Specifically, as optimization refers to the process of increasing efficiency, it also deals with the tendency to prefer short-term financial gains (due to the aggressive and competitive spirit that characterizes private and public businesses) rather than sustainability. Lastly, optimization and rivalry on the market merge with a highly differentiated environment composed of countless stakeholders responsible for preserving and accomplishing the various functions of the society (institutional fragmentation).

This expansion of complexity recognized under the name of "creeping dependencies"[56] is a phenomenon expected to grow and continue in the foreseeable future. Therefore, the urban societies in which we live must be shaped to be resilient and collaborative, on behalf of the assumption that the flows of knowledge, goods, capitals, people, and services depend on each other.

[55] Hillier, B., & Sahbaz, O. (2008). An evidence-based approach to crime and urban design, or, can we have vitality, sustainability and security all at once. *Bartlett School of Graduates Studies University College London*, 1-28.

[56] A concept reported by Hills, A. (2005). Insidious environments: creeping dependencies and urban vulnerabilities. *Journal of Contingencies and Crisis Management*, *13*(1), 12-20.

Vertical integration intended as stakeholders' involvement at different administrative levels, and horizontal integration, recognized as collaboration between the state, market, and civil society, must be achieved so that the safe and efficient functioning of society can be reached.

Only through joint efforts safety, security, and sustainability in cities can be accomplished. Hence, all the city models that address dependencies and that perceive citizens, businesses, and institutions as actors willing and able to fulfil and promote urban security, safety, and sustainability have the potential to become prototypes entailing best practices that should be replicated on a large scale[57].

Indeed, once a model is certified as effective in a precise and inscribed area, consistently with the logic and practice of the evaluation of public policies, it is eligible for application in other different circumstances, to further test its effectiveness. Then, once again, if it has been acknowledged as a program able to provide positive outcomes, nothing impedes to continue to expand its scope, generating a wider virtuous circle and creating best practices to be reproduced.

Nonetheless, returning to the core of the issue, namely the attention towards security and sustainability, it appears that these two elements have a place in the overall framework of environmental and ecosystem responsibility, which call for new systems of urban governance and policing so that high-quality communities' well-being and participation are ensured.

It is for this reason that Smart Cities and Eco-Cities feel the necessity for more open, accessible, and liable systems of governance, where local powers and responsibilities lie within the general principles and directives set at the central level but are even able to design innovative and strategic urban-centric protocols and guidelines appointing the particular urban context and connecting institutions, private companies, and citizens[58] which can harmoniously contribute to minimizing tensions between the three pillars of sustainable development that are the economy, the society, and the environment[59].

When this happens, even the variety of security issues occurring in cities emerge with a new beneficial prominence, requiring new attention and driving the political dialogue towards the elaboration of avant-garde solutions.

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[57] This view is consistent with the study Becker, P. (2011). Understanding dependencies: why safety, security and sustainability are increasingly challenging for cities and regions. *Training Regions Professional Papers*, *1*(1), 1-6.

[58] It is not a case that even the UN 2030 Agenda for Sustainable Development explicitly refers to the "regional and subregional levels" in paragraph 80. These subjects are mentioned to implement the Agenda at the sub-national levels of governance. Indeed, local authorities are entitled with the necessary leadership to mobilize major groups and provide the bottom-up and inclusive angle to facilitate wide stakeholders' partnerships and the consequential provision of services.

[59] For further information, it is possible to refer to Jacquier, C. (2008). Urban Governance: forging a path between complications and complexity. *Towards New Territorial Governance*. Paper presented at the symposium ''Towards New Territorial Governance'', Reims, France.

These strategies are indeed elaborated according to the place in which they are inscribed, and therefore they mirror forms and substances accordingly to the practical social, political, and economic conditions, sometimes even welcoming and including new and unexpected partnerships.

It is the ability and tendency to include different actors in the decision-making processes that allow a clear reference to open and multi-level approach, praising the idea of co-production: subjects with different backgrounds, interests, and competencies merge together to invent, plan, fine-tune, and put into effect policies that will be managed also by local authorities and active communities[60].

Therefore, without open and local governance the possibility to bring new programs and initiatives closer to citizens would be hampered, as well as the opportunity for local residents to have an opinion and a role over the implementation, monitoring, and final evaluation of policies.

Conversely, the admirable aspect of this multistakeholder and collaborative governance attitude towards the creation of local public programs is the possibility to give voice to those who have never been in powerful positions and that with these new patterns of decision-making could give decisive inputs to oppose discriminations and their consequences, thus suggesting policies that increase their well-being.

However, it is imperative to have a security system that guarantees a beneficial and peaceful exchange of views, as well as the equal involvement of different actors. Indeed, once this basic safety condition is assured, even public services are granted and delivered in an easier manner, thus generating positive perceptions among the recipients, who recognize increasing levels of accountability and transparency in the local administration, a feeling that leads to growing levels of citizens' trust towards the public administration[61].

Thus, in any urban dimension, but even more so in Smart Cities and Eco-Cities, security becomes the prerequisite to ensure the pacific performance of the multiple urban activities, which are related to governance in a transversal way.

[60] Among the supporters of this we can find Giddens, A. (2003). *Introduction: neoprogressivism: a new agenda for social democracy*. The progressive manifesto: New ideas for the centre-left, 1-34, as well as Schuppert, F. (2005) '*The Ensuring State'*, in A. Giddens (ed.) The Progressive Manifesto: New Ideas for the Centre Left, pp. 54–72. Cambridge: Polity Press.

[61] As it emerges from Savoldelli, A., Misuraca, G., & Codagnone, C. (2013). Measuring the Public value of e-Government: The eGEP2. 0 model. *Electronic Journal of e-Government*, *11*(1), 373-388.

Moreover, in the Smart Cities and Eco-Cities discourse concepts such as wellbeing and quality of life are redundant, as they are considered symbols and elements to measure the dimension of public value and the way in which it is administered and delivered among the community[62].

In these two urban prototypes communities become new proactive actors involved in a plethora of activities not only related to governance (transparency, accountability, top-down progressive policies, and bottom-up inclusion) and safety (wider sense of belonging, tolerance and respect among people, controlled and reduced episodes of crime and anti-social behaviours), but even to the intrinsic meaning of citizenship (active citizenry, political engagement, social human capital development[63]), the capability to concretely modify and maximize the quality of life (high satisfaction, accessible and optimized public services, balanced and pacific coexistence among different social groups, and job opportunities), and the newly acquired knowledge on the environmental dimension (efficient use of resources, circularity, and re-use) that orients urban practices.

[62] Public value could be intended as the net benefit of public services computed not only in monetary terms, but even accordingly to democratic principles that are transparency, participation, citizenship, equity, freedom, and security. This definition can be found in Moore, M. H. (2013). *Recognizing public value*. Harvard University Press, and it explains the proactive attention that new urban models give to initiatives enucleating these elements considered as objectives to be achieved.

[63] Especially the social and intellectual capital belong to that social infrastructure (made of people ad education) proven to be essential for the proper development of Smart Cities, as it creates the conditions for the development of a creative class able to foster Smart Cities programs. Indeed, smart, educated, and informed people are a significant resource for the development of the city, as they actively deal with a Smart City or Eco-City initiatives while contributing to the urban competitivity, economic growth, governance, and management of the city itself.

Chapter 2: Urban security

2.1 Security in the urban sphere

Cities around the world are confronted with security problems that manifest themselves in a variety of guises: urban violence and other forms of crime and disorder, anti-social behaviour in public spaces, and a sense of insecurity linked to both crime and incivility.

Urban agglomerations are places of interaction and mediation between actors and phenomena that are typical of the local level, however without being independent and immune from the processes of globalization. In this context, violence is very often the means to mediate, manage, and settle various dynamics, to the point that scholars such as Armao have considered it both as a direct mediator, which delineates the territory by drawing its boundaries, and as an indirect mediator, being it an instrument that creates work (there are experts in violence such as hit men or arms dealers) and increases the flow of money (just think of illegal trafficking or extortion)[64].

Generally, the response of the competent authorities has to do with a tightening of the formal control system, be they police or private security services, although researchers and experts agree on the usefulness of resorting to integrated and multidisciplinary actions, otherwise they risk being ineffective.

The intricate process of identifying and implementing security measures to counter urban insecurity requires the participation and meeting of the needs and interests of a wide variety of actors, such as public safety authorities, urban planners, the staff responsible for the maintenance and management of cities, social workers, teachers and educators, traders, and, last but not least, the citizens themselves. As a result, dealing with security and, specifically, urban security, is complex.

Given that, it is possible to deduce that, in order to define and establish policies that make cities safer, it is essential to resort to decentralization, so that cities can exercise a primary role, respecting the specificity of each territory, and the other levels of governance can contribute to the realization of unitary policies consistent with national and international guidelines on urban matters.

To put local authorities in the spotlight at the expense of the national ones is also driven by the concrete need to respond to the desire for active participation that citizens repeatedly express, and it also encompasses the contemporary vision of cities as workshops of active policies, collaboration,

[64] Armao, F. (2013). Smart resilience. Alla ricerca di un nuovo modello di sicurezza urbana.

and prevention, concurring actions that provide solutions to the security problems that local institutions often fail to manage and solve[65].

Besides, local governments can act to establish or improve the safety of public places and counteract illegal conducts in cities, which are perceived as a set of phenomena, environments, behaviours, and relationship dynamics that constitute a community. The higher the level of security, the more these communities can be said to be safe, supportive, and cohesive. Therefore, in the elaboration of urban security policies, it is crucial to consider the heterogeneity of urban contexts and trends.

This concept of urban safety is the leading concern of this chapter. It will be analysed in terms of definitions, implications, and norms. Specifically, although urban security is a cross-cutting policy issue, now present in the legislative systems of the majority of countries affected by the phenomenon of urbanization and interested in managing it properly, especially in light of its environmental implications, here insights and descriptions concerning the Italian system will be offered, also by observing the evolution of legislation related to the aforementioned security policies.

To correctly frame the discussion, it is necessary to start from the meaning of the broad and very versatile concept of urban security, which is used to refer to various situations that underlie the presence or absence of conditions of risk or danger, such as urban warfare, terrorism, begging, vandalism, micro and macro crime events, juvenile deviance[66], and environmental degradation.

Another concept related to the one of urban security, and equally complex in terms of precise and universal definition, is that of legality. It should not only be understood as the principle of legality and respect for the rules, but more extensively as the maintenance of public order, peaceful and civil coexistence, respect for individuals, institutions, and the urban environment, freedom, honesty, and solidarity.

To seek a definition of urban safety, it is possible to start from the legal contributions that, in the Italian case, are identifiable in the so-called "*pacchetti sicurezza*", which over the years have been revised, amended, and updated.

In this long process that began with the first *decreto ministeriale 5 agosto 2008* on public safety and urban security, we arrived at the *decreto legge 20 febbraio 2017, n. 14, "Disposizioni urgenti in*

[65] Comments from Ferraris, V. (2019). Comprendere la legalità e la sicurezza, page 7.
[66] Deviance is identified as a conduct that deviates from the rules (not only legal) that govern a society. For an act to be defined as deviant it is necessary the existence of a specific social group in which this definition is recognized, the existence in that society of norms, expectations, customs, or beliefs judged legitimate or respected, the acknowledgement that a deviation of these shared rules is evaluated negatively by most of the community, the existence of negative consequences against the authors of the deviant behaviour.

materia di sicurezza delle città"[67], converted into *legge 18 aprile 2017, n. 48*[68], also called *"decreto Minniti sulla sicurezza urbana",* in which it has been stated, under Article 4, a clear and detailed definition of urban security.

It is classified as a

> "public good that pertains to the liveability and decorum of the city, to be pursued also through interventions of redevelopment, including urban planning, social and cultural, and recovery of degraded areas or sites, the elimination of factors of marginality and social exclusion, the prevention of crime, particularly predatory in nature[69], the promotion of culture, respect for legality and the affirmation of higher levels of social cohesion and civil coexistence".

Therefore, public safety refers to the set of activities and tasks attributed to the State, at a central and local level, structures and law enforcement authorities responsible for the protection of the public order and the safety of citizens, protection of property, control, and observance of laws and regulations. However, other non-institutional subjects are also called upon to take part in the management and provision of public security. To identify them, it is important to comprehend the meaning of "integrated security", which is centred on the principle of vertical subsidiarity, and of "participated security", inspired by the principles of horizontal subsidiarity, solidarity and participation, thus presenting itself as a form of open and shared security, realized by national and local institutions, citizens as individuals or members of a group, associations, schools, and economic actors.

Additionally, in the urban context, as well as in the wider national one, there is also the concept of social security, which concerns the system of assistance and welfare with related services provided by the state to citizens in need. Examples are health care and social security.

With reference to *l. n. 48/2017,* interesting insights emerge. Firstly, urban security overlaps with the quality of life of citizens and the liveability of the city, establishing a clear proportional relationship: if the quality of urban life decreases, security decreases, and vice versa, as the quality of life increases, security also increases. Also, to counter insecurity, a dual role is recognized for national and local police forces, i.e., prevention and repression of crimes (the so-called primary prevention),

[67] Shortened in d.l. 14/2017.
[68] Shortened in l. 48/2017.
[69] Predatory crimes are characterized by the use of force or artifice to take possession of the property of others. They usually involve direct physical contact between the offender and the victim and, considering the etymology, they are defined as such because the victim becomes prey of the criminal action of the offender.

as well as situational prevention to counter degradation and facilitate social cohesion (secondary prevention).

These two types of intervention refer to public policies of urban security inspired by the broader concepts of "security of rights" and "right to security", as the studies of the jurist and sociologist Alessandro Baratta have largely investigated.

According to the line of "security of rights", it is necessary to create a synthesis of new non-repressive policies, national and local in nature, that can prevent social exclusion through interventions on these dimensions. This vision is the result of the collective perception of the failure of the more canonical anti-crime policies that, through criminal repression alone, cannot help but show limits and ineffectiveness.

On the other hand, the "right to security" approach reflects skepticism about the re-educational purpose of the penalty and induces the creation of criminal policies aimed at neutralizing crime and criminals, thus implementing zero tolerance[70].

To have a better understanding of the pragmatic differences between these two approaches, it is possible to confront the following table, translated from the work of Baratta in 2001.

Figure 2. Differences between "security of rights" and "right to security".

SECURITY OF RIGHTS	RIGHT TO SECURITY
Social inclusion	Social exclusion
Security for all rights and all people	Security for the strong against the risks coming from the weak and excluded
Democratic policies aimed at empowerment	Technocratic policies to preserve the social status quo
Local participatory policies	Central, authoritarian policies
Demand for security intended as security of all rights	Demand for security intended as punishment against crime
The criminal policy is a subsidiary element within a broader security policy	Security policy is a criminal policy
Public security policy. Security is a	Private security policy. Security is

[70] The term zero tolerance originated in the campaign against crime that the former New York Mayor Rudolph Giuliani implemented in the 1990s. His policies were focused on the repression of all violations, even of minor gravity, and phenomena of social disorder. In Italy, this approach has been repeatedly invoked in urban security policies to classify interventions to control and contrast uncivilized actions that can be ascribed to social and urban disorder, such as begging, harassment in public, and abusive behaviours.

public service. Policemen become citizens (community policing)	a business. Citizens become policemen (neighbourhood watch)
Affirmation of equality and unrestricted use of public spaces by all people	Acceptance of inequality and self-limitation behaviour by potential victims
Security within the framework of the constitution and rights	Security through the reduction of fundamental rights
Security as a policy of an "open Europe"	Security as a policy of the "stronghold Europe"

Source: translated and revised from Baratta, A. (2001) Diritto alla sicurezza o sicurezza dei diritti? in Anastasia S., Palma M. (2001), La bilancia e la misura, FrancoAngeli, Milano, 19-36.

Returning to the concepts of urban security and legality, it is important to note that citizens make requests to the local authority, whose representative is the mayor, responsible for ensuring public policies and investments for the care and use of the urban territory so that everyone can enjoy the rights, resources, and opportunities that derive from it. In doing so, local stakeholders must repress crime and protect the safety of those who live in the city, without neglecting to promote cohesion and legality.

This *modus operandi* is due to the multidisciplinary nature of security and legality: as the former is not only public order, the latter is not the only repression of crime.

Therefore, the deep connections between the two issues require integrated management, and the local government, aware of this, is able to carry out different interventions, which are, however, always coordinated in a broader organic strategy aiming to ensure cohesion, integration, urban regeneration, safe and liveable public spaces, respect for rules, peaceful and profitable coexistence[71].

Nowadays, urban security plays a very important role in public opinion – being it a social phenomenon that differs across the country and is associated with various local and global issues – to the extent that it has become a political entity, that is, an object of political will and the situation to be targeted and managed by local public policies.

Moreover, as this theme provokes interest and requires the responsibility of different actors, be they institutional or non-institutional, it also has a significant cultural value.

Recalling what has been described so far, in order to understand the broad and shared meaning of urban security, it is appropriate to reflect, first of all, on the specification "*urban*" which serves several purposes.

[71] Ferraris, V. (2019). Comprendere la legalità e la sicurezza, page 15.

First and foremost, it gives security a new perspective, no longer exclusively intending it as the absence of threats, but also considering it as the positive and proactive measures to achieve and maintain that status perceived by citizens[72].

Secondly, this adjective evidently refers to the place where most of the problems of insecurity happen, thus entailing the necessity for *ad hoc* interventions and addressing a specific class of institutional actors responsible, at the local level, for the provision of solutions to citizens' problems: city administrators.

Lastly, in line with the previous consideration, if security is portrayed as an urban problem, then it is possible to identify a new leading role for municipalities and regions that in the past were not significantly involved in preventing and combating crime.

Furthermore, to outline a scenario of urban security, which entails preventive and ex-post measures, it is necessary to identify and reason over three elements that can be considered the foundations of security, namely *(i)* crime trends, *(ii)* crime perception, and *(iii)* the effectiveness of anti-crime measures.

More in detail,

(i) Crime trends can be studied because criminality follows a cyclical evolution that varies according to the different categories of lawlessness.

Inevitably, crime, like other occurrences, is and can be influenced positively or negatively by other social phenomena, and this is the reason why scholars ask themselves what types of change – e.g., in demographic, economic, political, and environmental variables – may influence tomorrow's crime.

Throughout Europe and the United States, there are many occasions to gather and discuss the resonance that social events have on crime.

Among these circumstances, there is the increase in youth unemployment, violence in drug markets, ethnicization of organized crime[73], the spread of firearms among young people, police's attention to the prevention of terrorism, conditions in prisons, reduction of welfare spending levels, electoral proposals for policies of exclusion and repression of immigrants, and enduring low birth rates.

[72] As highlighted by Zedner, L. (2000). The pursuit of security. *Crime, risk and insecurity: Law and order in everyday life and political discourse*, 200-214, page 201.
[73] Think about the Nigerian mafia in Italy.

Furthermore, among the processes that modify and increase the most the level of crime, there is the fact that large cities in single states are dense. Indeed, the larger and more widespread urban centres are in states, the more crime tends to establish, grow, and branch out, not so much because of numerical values (i.e., city residents), but because of the intrinsic characteristics of cities, whose mix of social exclusion and opportunity act as a magnet for illegality.

It is also necessary to consider how, in urban settings, some neighbourhoods have been transformed over the years by the unlawful activities conducted by mafia groups and local gangs. These two entities have turned some neighbourhoods into outposts of control and strategically important hubs to conduct their trafficking, exercise coercive power, and profit. These groups often operate as businesses in specific environments, exploiting local strengths and weaknesses to their advantage, and subjecting residents to their own sphere of influence and power.

Another point of reflection has to do with the validity of the current instruments for fighting crime and their future adequacy, with a clear reference to the technological advances that are an added value for both security forces and "insecurity forces".

There is no secret that most of the strategies for fighting crime and securing urban spaces recognize the great value of Information and Communication Technologies, which have created significant development opportunities for all urban policing techniques. A clear example, recognized at the international level by UNDOC, is the use of innovative analysis techniques based on crime mapping and the consequent data gathering, whose information can be studied through specific software in order to realize appropriate countermeasures to violence and crime. In this logic, putting technology at the service of the armed forces is a fundamental pillar for the realization of new urban security strategies and everything is easier in the framework of Smart Cities that by definition are projected towards the pervasive development – albeit in security – of technology.

Moreover, addressing the future scenario of delinquency rates, it is fundamental to take into account the new dynamics fuelled by climate change, which must be intended as a driver of new urban (in)security events and their consequential policies. In this contest, many are the cities that are willing to become Eco-Cities, so as to focus on physical and ecosystem/environmental safety[74].

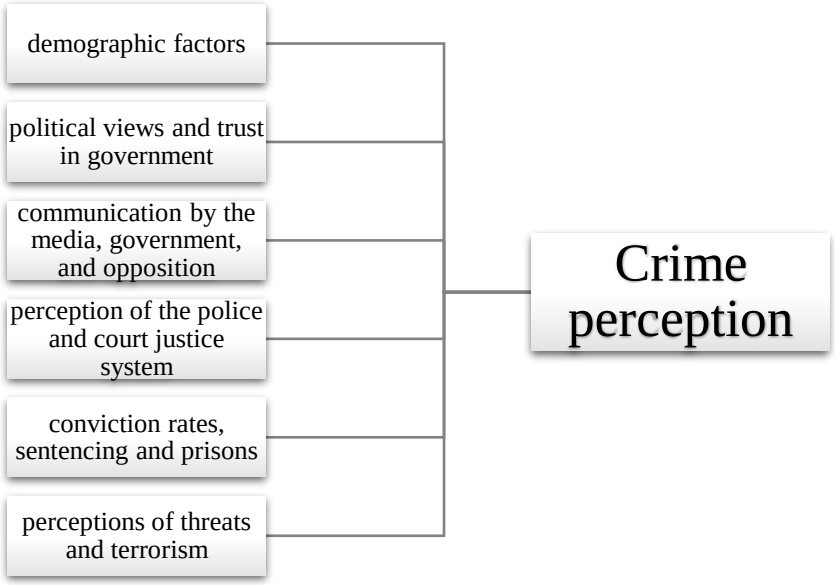
[74] As it is possible to deepen in Armao, F. (2013). Smart resilience. Alla ricerca di un nuovo modello di sicurezza urbana, page 8-9.

(ii) Crime perception is the sensed amount of criminal activity in a specific place or the risk of victimization, namely the risk of an individual becoming a victim of crime[75]. People's perception of delinquency is not often consistent with statistics; therefore, it exists a misperception that can lead to an overestimation or underestimation of the conditions of safety.

As people's viewpoints influence plenty of activities, this wrong judgment pressures routine, social behaviours, economic dynamics, and, overall, the whole urban life. Thus, it is important for law enforcement agencies and governments to appoint plans and campaigns that bridge, or at least diminish this perception gap. Yet, to do so, it is necessary to analyse social, demographic, and environmental elements as part of a unique framework[76].

Individual and collective opinions on crime and crime rates are driven by different factors, as the scheme below simplifies.

Figure 3. Factors that influence crime perception.



Author's elaboration.

Just to give empirical examples, considering the variable "demographics", groups composed of adult and low-skilled individuals tend to have a negative perception of the

[75] Two elements increase the chance for a crime to occur: the more vulnerable the victim is, and the more willing the offender is to commit the crime.

[76] Vallejo Velazquez, M., Kounadi, O., & Podor, A. (2020). Analysis and mapping of crime perception: A quantitative approach of sketch maps. *AGILE: GIScience Series*, *1*, 1-18.

security within the city and this perception is generally the result of their voting patterns (conservative spirit and blame on the government for poorly addressing crime).

Then, the role of communication and the public opinions about the police have an intensive influence on crime's views. While the media play a key role according to their ability to capture and polarize the public debate, highly trusted law enforcement authorities increase confidence in urban safety, to the point that some may argue that police ineffectiveness derives from the public system regulated by politicians and civil servants. Nonetheless, regarding police agencies, whether the level of crime is perceived as low or as high, it is crucial to constantly invest in services related to those who concretely manage insecurity phenomena, ensuring good updating courses, improving customer services, and communication. Another element influencing crime perception is, for example, the leniency of sentencing and prisons, even more so considering how many people advocate for the building of more jails[77]. However, a significant portion of researchers and the general public believes that through preventive interventions and less punitive and more rehabilitating techniques, the prison system could provide a more effective outcome in terms of non-recidivism of its guests[78].

To conclude, given that perceptions as important as crime and security, a virtuous path to follow to minimize misconceptions about crime rates deals with communication and public engagement, since, in the end, misunderstandings revolve around lack or low levels of confidence.

In practical terms, diversified information should be collected through a variety of locally driven surveys. Then, data should be conveyed to the audience in simple, clear, and effective manners, without leaving too much margin of misinterpretation. To do so, the input for the collection of data dealing with urban insecurity rates and the dissemination of such information should be requested and managed by the government or other urban local authorities, thus commissioning politically independent reviews of crime events and objectively broadcasting them, without exploiting the fear of citizens, because accurate information means informing about the risks and urging caution while explaining the

[77] In Italy, for instance, to cope with the overcrowding emergency in prisons, the Government stated – prior to the Covid-19 emergency – that it wanted to convert old unused barracks into new prisons, transform – thanks to collaboration with the Ministero delle Infrastrutture – abandoned public buildings into jails, and requalify existing ones. These statements were made in response to the survey conducted by the European Committee for the Prevention of Torture and of Inhuman or Degrading Treatment or Punishment in March 2019, whose report came out in January 2020. For more information it is possible to consult https://www.sistemapenale.it/it/documenti/report-del-cpt-sulle-carceri-italiane-2019 .

[78] These considerations can be further analysed by consulting Duffy, B., Wake, R., Burrows, T., & Bremner, P. (2008). Closing the gaps–crime and public perceptions. *International Review of Law, Computers & Technology*, *22*(1-2), 17-44.

measures to counter the problem, thus reassuring the audience. Another subject that should be involved in this activity is characterized by law enforcement authorities, that possess punctual information on broad security issues. Generally, these agencies produce annual reports or flyers, but the step forward is to get in touch with the population, especially with those strata that usually stray from legality, through local initiatives, performance measures, and the modification of budget allocation. Indeed, the latter is a pivotal element linked to a direct and effective action of security forces over problematic neighbourhoods.

(iii) The effectiveness of anti-crime measures is, in a certain sense, linked to a broader discussion on the functioning of the penal system.

The latter is more effective the higher the deterrent capacity of the criminal sanction established at the end of a judicial process is. Similarly, the deterrent capacity of the criminal sanction is bigger the quicker the criminal process is (given that the amount of time spent from the commission of the crime to the sentence is brief).

However, nowadays there is another factor that endangers to diminish the effectiveness of criminal sanctions and the broader sphere of criminal prevention – a subject that will be addressed in the next lines. It is the issue of human and civil rights, which act as a limit to the investigative power of police agencies and which, by affecting the rights of the indicted and procedural guarantees and risks further slowing down the criminal process.

However, policies and practices designed to suppress rights in favour of greater security would only crack and jeopardize the already difficult balances of the criminal justice organization and the more general system of administration, as well as threaten – not defend – individual security. More precisely, to think of suppressing and denying human and civil rights in criminal law in order to repress crime with a greater force not only poses a major ethical problem, but also a legal one, since most of the legal systems, and in particular the Italian one, recognize the so-called inalienable rights, that are legal positions of the person considered essential[79].

Concerning the Italian legal system, the acknowledgment and protection of inalienable rights characterize the democratic state insofar as they pertain to the fundamental values and freedoms that the legal system recognizes to man both as an individual and as part of social formations, and not because of citizenship. These rights cannot be violated even by

[79] Inviolable rights are also protected from the international point of view through a series of Acts and Conventions such as (i) the Universal Declaration of Human Rights, approved by the United Nations Assembly in 1948; (ii) the European Convention for the Protection of Human Rights and Fundamental Freedoms, adopted by the Council of Europe in 1950; (ii) the Charter of Fundamental Rights of the European Union, in force since 2000.

the ordinary legislator and are subtracted from the power of constitutional revision because they belong to that body of constitutional norms and principles that cannot be modified either by constitutional law.

Among the constitutionally recognized inviolable rights, some have more relevance to the security issues addressed in this thesis. To name a few, personal freedom is inviolable and is to be understood as physical freedom (from external constraints) and moral freedom, although there are limits placed by the so-called *riserva di legge*[80]or by the motivated provision of a judge. The freedom of domicile is also guaranteed, as well as the freedom and secrecy of correspondence, which can be limited only by a reasoned act of the judicial authority[81]. Another inviolable freedom linked to the criminal and security context is the right to physical integrity, which belongs to the so-called personality rights and establishes that the death penalty or torture cannot be carried out. The individual then has significant rights in the sphere of criminal law: the judge is always established by law based on competence for territory and subject, special judges cannot be established, no one can be punished except under a law that came into force before the fact committed[82]. Besides, criminal liability is personal, therefore no one can be held accountable for a crime committed by others and no defendant can be considered guilty until finally convicted[83].

That said, resorting to the basic meaning of anti-crime measures and their effectiveness, to engage in a comprehensive discourse, it is necessary to refer to crime prevention and, given that the matter of this dissertation is grounded in the local level, urban or community crime prevention should be mentioned and investigated.

On the back of the opinion that safety conditions in urban areas can be achieved through actions towards offenders and citizens themselves[84], community crime prevention strategies are interventions aiming to change the social conditions deemed as responsible for crime and insecurity phenomena in urban societies.

These measures can be both formal and informal. The former category includes activities such as law enforcement, environmental design, situational crime prevention[85], social,

[80] The *riserva di legge*, included in the Constitution, provides that the discipline of a given matter is regulated by primary law and not by secondary sources. It has a guarantee function to ensure that in particularly delicate matters, as the case of the fundamental rights of the citizen might be, decisions are taken by the most representative body of the sovereign power that is, according to article 70 of the Italian Constitution, the parliament.

[81] As in the case of wiretapping, conducted for security reasons.

[82] This is the principle of non-retroactivity of the criminal law, and it pertains the *riserva di legge penale*.

[83] As the principle of presumption of innocence sets.

[84] To reduce citizens' potential crime victimization levels in daily activities.

[85] Discussing prevention to reduce criminal behaviours and their effects on things and people requires a thorough study that recognizes these behaviours as the result of a mix between predisposition and opportunity. While predisposition is a

educational, and employment programmes, which are performed by institutional actors, namely police and government.

The other class, informal crime prevention measures, consists of personal precautions, surveillance, community initiatives, socialization of young people, and major engagement with police authorities. These strategies are played by families, households, and community associations.

Both these formal and informal dynamics to prevent crime manifestations are praiseworthy and, through synergy, can co-produce safety in the urban environment.

It goes without saying that citizens' partaking in such programmes is voluntary but must be wide, otherwise, it would be ineffective. Therefore, for civil society to be involved, cities require a precise governance scheme that facilitates participation, and Smart Cities and Eco-Cities could, through their specific features, emphasize the sense of community belonging and offer pragmatic tools to actively contribute to security-related initiatives without resorting to coercive methods. By the way, when considering citizens' engagement with police matters, an objective point of view is mandatory: even if the poorest neighbourhoods are the ones that should be targeted the most by community actions to tackle down criminal behaviours and should be more in touch with law enforcement authorities to avoid costs of private protection, they are the less interested because their few possessions are not attractive to lawbreakers. On the other hand, members of the wealthiest social class are the most vulnerable to crimes, above all predatory, but they can autonomously afford the expensive costs of private protection, thus not constantly engaging with public bodies of security. However, if it is true that belonging to different social classes influences the way of relating to the police, it is also true that, regardless of rank, people run risks within the city's public space and it is the duty of local authorities to ensure security measures on the territory in order to explicitly counteract crime, be they more police patrols, repress more severely criminal activities in public, or improving street lighting and surveillance footages[86].

constant in human behaviour that is modifiable only in the first few months of life, opportunity can be altered through situational prevention, as crime is believed to manifest from psychological, economic, social, cultural, and political variables. Situational prevention interventions aim to reduce the amount of crime and its effects, as well as psychological and social prevention do, and lighten the criminal justice system, thus acting in the long term. In concrete terms, situational prevention uses the criminal justice system to sanction detention or monetary penalties – depending on the case – and thus discourage criminal behaviour. Hence, the role of law enforcement also changes and becomes more closely tied to investigation and surveillance functions, rather than judicial ones.

[86] Hope, T. (2017). *How to Measure the Effectiveness of Community Crime Prevention*. Center of Excellence in statistical information on government, crime, victimization and justice. A project by UNODC.

In the next two paragraphs, “urban security policies” will be presented and studied in two different, albeit consistent, ways. Paragraph 2.2 will provide a general overview of urban security policies starting with the reasons why they are needed, considering the demand for cooperation on several institutional levels, assessing what practical interventions are to be adopted, and, last but not least, the need for educational training on the topic. Paragraph 2.3 will analyse the same themes but in the Italian regulatory context.

2.2 Urban security policies

The so-called urban security policies, in simple terms, are programs conceived and managed by local administrators to counteract phenomena of insecurity in the city context. Indeed, since the early 1990s, policymakers and security authorities have been confronted with a new social problem, namely personal insecurity, as well as its causes and its consequences.

This form of insecurity, if closely investigated along with the phenomena that feed it, originates in urban public space and that is why the policies that deal with reducing or eliminating it are classified as urban security policies.

Thus, personal insecurity is a city phenomenon that has grown over time and has acquired specific characteristics as a result of this constantly evolving and often degenerating urban environment. Therefore, classifying urban insecurity as an urban social phenomenon allows us to identify the links with the public spaces and events that generate it: the visible presence of poverty and marginality, the sometimes-non-peaceful coexistence of different ethnic groups and cultural codes[87], conflicts over the use of public space, and criminality arising from the public arena.

Urban insecurity should be considered as an umbrella term that encompasses different phenomena and presents itself in different forms.

Among these, we can identify crime, namely a form of insecurity deriving from the risk of being a victim of criminal acts against personal safety or property. The reference to this serious phenomenon, that acquires relevance both in terms of individual and collective insecurity requires further investigation, and, by doing so, it is possible to understand that even if crime feeds urban insecurity, they are two different phenomena, whose dividing line is often not clearly recognizable.

[87] The discourse related to ethnic diversity raises many questions, including the difficulty of understanding and predicting the individual behaviours of people or groups that are perceived as "the others". Inevitably this broad complexity has effects in terms of security.

To facilitate differentiation between these two it is possible to refer to the table below, which reports two variables, namely the rate of identification and the level of involvement of the population that urban insecurity and crime entail.

Figure 4. Differences between urban insecurity phenomena and crime phenomena.

	RECOGNITION	POPULATION INVOLVEMET
URBAN INSECURITY	Imperfectly defined	The totality
CRIMES	Perfectly defined	A portion

Author's elaboration.

As it is possible to observe, regarding the possibility of precisely identifying the phenomena of urban insecurity and the one of criminality, while the former refers to a plurality of social events that are difficult to pinpoint, the latter is the juridical reconstruction of certain social phenomena, and for this reason, is perfectly recognizable.

In detail, crime manifests itself in the form of petty criminality (drug dealing, exploitation of prostitution, trafficking, deviance, vandalism, damage), predatory crimes and crimes against property (thefts, burglaries, robberies in stores, pickpocketing, muggings, fraud, computer fraud), and crimes against the person (homicides, assaults, injuries, threats, insults, sexual violence)

On the other hand, dealing with the rate of involvement of the population interpreted in terms of responsibility, these two different – but often correlated – phenomena recall different levels.

Indeed, urban insecurity involves the totality of the population, often in the dual role of victims and perpetrators of insecurity, whereas criminality involves only a small portion of the population, namely those who have committed actions legally identified as crimes.

Public decision-makers can intervene in several ways to reduce crime. For example, through the presidium and control of the territory by the Municipal Police and specific units and services (*polizia di prossimità*, *nucleo di vivibilità*), through the installation of technological systems for the protection of public buildings and for the monitoring of the territory (video surveillance, alarm systems, anti-intrusion systems, emergency columns) that are typical of Smart Cities, and then, through coordination and situational prevention (Crime Prevention Through Environmental Design - CPTED), without forgetting support to the victims of crime and violence, thus establishing trust in police forces.

Social disorder is another form of urban insecurity, and it deals with antisocial behaviours and lack of control over breaches of the rules of civil coexistence, deviance, and vandalism in the public space.

Even situations that endanger the urban decorum, as commercial squatting and illegal occupation of public land are entailed in the concept of social disorder, not to mention the presence of harassing individuals on the street and the improper use of the public environment that fuels conflict between people or groups. To address these situations, the keyword is prevention: social prevention for communities or vulnerable groups based on mediation and integration, and situational prevention in areas at risk through education to coexistence and cohesion. Moreover, security must become "more available" in public spaces, thus increasing the presence of agents on the ground and punishing vandalism, commercial abuse, and illegal occupation of public land.

Physical-environmental degradation is another form of insecurity resulting from the perception of poor quality of life and neglect, dirt, inadequate public infrastructures' maintenance, poor or absent public lighting, traffic, pollution, and hydrogeological disruption. To counter these events, local administrations should resort to constant territorial monitoring actions to ensure punctual and lasting redevelopment interventions, enhance public lighting and waste sorting, increase the usability of public places such as parks, playgrounds, and roads for sustainable mobility.

Another phenomenon that falls into the broad category of urban insecurity is social and relational decay, which arises from the perception of isolation and abandonment in a social context of hyperactivity, characterized by tight, oppressive, and stressful rhythms. An individual experiencing this difficulty deprives himself of social ties, distrusting others and isolating himself. The sense of solidarity is lacking and is replaced by suspicion and intolerance, which do not allow for integration, including ethnic and racial. Family units and social groups of different ages or origins are fragmented and characterized by conflict dynamics. To counter this situation of strong individual and collective discomfort, interventions are needed to combat loneliness, marginalization, and poverty, which often need to be addressed from a psychological perspective. Also, social prevention and education campaigns are needed to promote social cohesion, integration, civic sense, and the importance of living in a community.

The previous form of insecurity is also linked to the so-called social alarm, that is, the uncertainty deriving from fear and the subjective perception of crime that, as already addressed in the previous pages, is fed by the media that treat security in emergency and often apocalyptic terms, triggering alarmism and concern. In order to solve this, it is necessary to reassure and create opportunities for the collective exchange of moderate opinions.

That said, it is important to bear in mind that there are also social phenomena that not only destabilise individual, collective, and urban security but also negatively affect higher levels, stigmatising the nation itself.

This can be exemplified by the degradation in public space combined with violence, predatory, and organised crime, all phenomena that generate a market that is parallel to the legal one. In this illegal marketplace, the demand for certain goods meets the supply of services without any regulation, as it is for the case of prostitution and human trafficking, illegal immigration, exploitation, drugs, and organ trafficking.

However, it is necessary to specify that urban security policies deal principally with the social effects of personal insecurity and the events that nourish it in the territorial context, although they do not exclusively coincide with policies to guarantee public order. Precisely, this differentiation emerges from the fact that, as previously reported, urban insecurity derives from several causes: some come from criminality (explicit and direct threat to people's physical safety) and violence in relationships of affection, others from the perception that inhabitants have of the public environment as a playground of danger, and still, others from the phenomena of urban decay, disorder and deviance that undermine civil and peaceful coexistence.

Starting from these considerations, it is possible to understand why urban security policies must be well rooted in the territory, allowing local authorities in charge of security to plan measures that positively affect the quality of life of urban space, contribute to its proper maintenance, manage territorial criticalities with a long-term perspective, and counteract social alarmism.

Moreover, what cannot be underestimated is the role of local authorities in promoting urban planning choices that enhance and emphasize urban development and the competence to direct, through urban police, trade, and decorum regulations, the behaviour of those who inhabit the urban environment to establish order. Included in this broad category of policies there are also measures and incentives that regulate investments – including private in kind – to counteract the degradation of the commercial fabric, protect the urban environment, and enhance the historical and artistic heritage. However, all local policies that increase the safety and liveability of urban spaces must also be accompanied by communication campaigns and strategies where the role of citizens themselves is rethought and revalued. Undeniably, civicism has significant effects on the quality of public space, and if it was genuinely practiced and promoted, many security interventions would not be necessary, as it would be public action, understood as the action of residents, to counteract the onset of insecurity phenomena.

The urban environment can be truly promising for the identification, application, and monitoring of security policies designed to reduce crime in a variety of sectors, including common delinquency, organized crime, and economic crime that, for example, according to the economic-criminal context

and the regulations in force, can break down barriers to access in small businesses, public contracts, subcontracting, the credit market[88], intellectual property[89] , and vice[90].

What is truly important is to ensure that these security policies are increasingly embedded in the territory, thus responding to specific cases identified from quantitative and qualitative assessments. If so, even budget allocations would be spent efficiently, without any waste.

Besides, urban security policies need to embrace the concept of prevention without hesitations, thereby changing the culture and functional identity of security professionals and institutions that previously operated only on the dynamics of deterrence, requiring criminology to investigate and find empirical data on how and where to intervene to reduce crime, and establishing greater partnerships among security stakeholders such as police, correctional institutions, disadvantaged families, urban planning institutions, national and local administrative agencies, and producers of crime-attracting goods.

The idea of prevention is often connected, when analysed in its pragmatic side, to two terms: "situational" and "social".

References to situational prevention measures entail an increase in the protection and surveillance of places through technology, formal surveillance by police officers, specialized units, private security guards, doormen, and drivers, control of flows of people through architectural barriers (turnstiles, fences, guided paths), mechanisms for identification of assets, and rapid removal of obvious signs of a crime recently committed, so as not to generate a sense of satisfaction or excessive media coverage.

On the other hand, when talking about social prevention, reference is made to initiatives aimed at combating juvenile discomfort, re-educating prisoners, supporting victims of crime, mediating and solving conflicts in public spaces, recovering drug addicts and people forced into prostitution, guaranteeing support for weak categories who have difficulty entering the job market, and offering social, psychological, health and legal assistance to the indigent, the sick and migrants.

There is also another strategy to counteract urban insecurity, namely community prevention. It consists of strategies to promote and increase participation in prevention activities by the inhabitants of a specific area of the territory. It can be displayed in terms of social support to the community, enhancement and amelioration of the physical and social environment, and surveillance of the territory from the citizens themselves. Therefore, it includes community actions to develop the

[88] Through usury.
[89] Counterfeiting of brands.
[90] Gambling, prostitution, and drugs.

municipal and collective life of those who reside there, to decrease and avoid the onset of insecurity, as well as informal actions of social control, as they are conducted by residents to contrast or promptly intervene against forms of deviance.

This form of informal control can make use of information campaigns for the use of toll-free numbers, applications for smartphones to report illegal acts or problems, traditional surveillance in the hands of citizen volunteers, and "neighbourhood watching", that is, self-organization between residents of the same area to control the spaces around their homes[91].

In other words, this community prevention can be declined in an inclusive logic, where the community mobilizes to empower and ensure participation, or in a defensive logic, that is, making the community self-organized to defend itself from a phenomenon perceived as a threat.

There is still another form of prevention, called early prevention. It mainly originated in North America and moves from considering people as potential offenders since, according to numerous psychological theories, individuals behave differently, committing or not committing illicit and deviant acts. Prevention measures with this regard aim to increase the education of the person by minimizing individual, family, social, and environmental risk factors. Obviously, depending on the target audience, early prevention programs vary.

Then there is another approach – multidisciplinary – that has developed from notions of criminology, planning, environmental psychology, and environmental criminology, namely Crime Prevention Through Environmental Design (CPTED)[92], a perspective on insecurity and crime that identifies certain characteristics of the physical and social environment as preconditions for the advent of criminal activities and, through interventions to modify them, it prevents the occurrence of criminal events.

This is in line with the thought that "proper design and effective use of the built environment can lead to a reduction in the fear and incidence of crime, and an improvement in the quality of life"[93].

Considerations of CPTED began to emerge in the 1960s in America when sociologist Wood began working on the microenvironment of working-class blocks in the United States. Under these circumstances, she discovered that any housing project could never rely on and employ enough police officers, janitors, technicians, and experts to prevent and keep crime from occurring. Therefore, it is

[91] Neighbourhood control has among its objectives the aggregation and creation of spontaneous networks between residents of the same neighbourhood or community in order to make the neighbourhoods safer and more secure, however without replacing the public authorities in charge.

[92] Term coined in 1971 by the criminologist Jeffery in the homonymous work "Crime prevention through environmental design".

[93] Crowe, T. (2000). Crime prevention through environmental design. Butterworth-Heinemann, 46.

necessary to intervene on the physical characteristics of public spaces in order to make them proper areas of meeting and visibility in which surveillance is facilitated. Thus, here are the first suggestions: to place benches, create parks and meeting areas near the entrances of private homes and public offices. In this way, it is possible to create exchange environments, in which to transit, stop, and spend free time, all in full visibility. It is then necessary to build relationships of trust with residents and provide different age groups with various services and goods that meet their needs, as well as to identify a local resident and charge him or her with the role of the janitor of the area, being the link between facility administrators and residents[94].

These measures are perfectly aligned with the very terminology of CPTED, as the term environment refers to people and their social and physical boundaries, while the word design refers to the physical, social, managerial, and regulatory arrangements of stakeholders that attempt to positively influence the human behaviour that affects the surrounding environment. Thus, it is in this scenario that CPTED programs condition variables related to the environment to prevent crime within it.

All these different types of prevention are beneficial and can be coordinated with each other in urban security policies. In this way, what is known as integrated prevention in the field of security is promoted. It refers to the need for local authorities to have a broad overview of urban complexities and to become aware of the need to pursue security through the integration of different public policies in a broad overall strategy since sectoral policies generate only partial effects[95].

With this regard, it emerges with clarity that security within cities can and must be enhanced through a synergic institutional work, able to connect national and local levels, which are two sides of the same coin: the demand for security and legality that citizens pose to the authorities requires an answer that is not only a synonym of repression and/or fights against crime, but also governance.

A precondition for the realization of urban security policies is, for example, good national policies that enhance cities from a social and urbanistic point of view, ensuring a continuous and adequate flow of economic allocations. Besides, a state that uses its authority to intervene, regulate, and sanction illegal markets of goods and services that affect the public environment is shaping urban security policies, as well as improvements in the processes of data collection and sharing, on-the-ground collaboration between state and local governments, and collaboration between national and local police enable the realization of urban security policies.

[94] Wood, E. (1961). Housing design: A social theory. Ekistics, 12(74), 383-392.
[95] Ferraris, V. (2019). Comprendere la legalità e la sicurezza, page 45-47.

Local governments too are called upon to conceptualize and implement urban safety policies, as they are accountable for positively influencing the quality and vitality of public space while ensuring that individual and collective risks are minimized. Therefore, it is essential to conceive, design, and plan cities and city services that must undergo a safety impact study. In Italy, there is still a need to invest and encourage the formation of a culture that links the professionalism and skills of architects and urban planners to the knowledge of security experts, so as to ensure a carefully detailed design of public space in order to minimize the occurrence of unsafe circumstances.

It should be specified that cities can become safer without the need to tear them down and build an urban plan *ex novo*, and the same argument applies to single neighbourhoods. Ensuring good maintenance of public areas, providing proper lighting, levelling surfaces are examples of local policies to prevent insecurity, as are the ordinary activities of local police and their regulations that, by providing order among members of the city's community, contribute to improving safety conditions. Even actions to equitably distribute and redistribute goods, services, and rights on urban land to counter socially problematic or conflictual situations are to be classified as policies for the reduction of insecurity, which very often act in an anticipatory manner.

We must be aware that urban security policies must be designed from the knowledge of the context of reference declined in demographic, social, and urban planning terms. Therefore, following the phase of context and needs assessment in which conditions of social disorder, physical degradation, and urban insecurity are identified, local police forces or other public and private entities are appointed and asked to intervene. Their role is not performed as single powers, rather as members of a broader structure that ensures, in a short time, interventions of various kinds that, even if they are not always able to completely solve the problems of the city, at least try to make certain urban conditions compatible with the regular and safe course of city life. Moreover, it should be noted that, in the designing and implementation of urban security policies, decision-makers should not be afraid to use the tools that technological innovation has made available, even if it must be recalled that technology can never replace governance.

This necessity of acquiring precise knowledge about the characteristics of the territory targeted by new security policies is becoming increasingly imperative, especially in local institutions. However, in order to have a complete and reliable view of the situation, it is necessary to combine forces and perspectives, and it is not unusual to contact and listen to external opinions when drafting urban security policies. Also, analysing the peculiarities of the area allows one to identify different problems and classify them correctly, that is, expressing only one concept at a time, demonstrating its objectivity, defining it in clear terms, and examining it in its complexity, identifying cause-effect

relationships with other events. In this way, it will be possible to define safety objectives in line with real needs and then be able to achieve them.

It is for this reason that territorial security policies cannot disregard the socio-demographic composition of the environment in which they will intervene, otherwise, the aspect of prevention and social inclusion will be compromised.

Therefore, the most important aspects include *(i)* population structure, in other words, density, birth and death rates, presence of lonely elderly, percentage of male and female population, density by age group, and family density; *(ii)* population-related flows, i.e., the natural balance[96] and the migration balance[97], the city's degree of attractiveness, and the intra-urban migration balance; *(iii)* the foreign population.

Then, regarding societal elements, importance must be given to *(i)* the level of schooling, *(ii)* economic-occupational fragility, *(iii)* welfare and social assistance policies, and *(iv)* housing fragility[98].

An evaluation for the definition of urban security policies that considers these dimensions results in programmes that target specific problems of insecurity, disorder, or conflict, and are designed specifically for some precise areas of a city. Some examples that can provide a less theoretical view are the aforementioned *(i)* situational prevention procedures, improving video surveillance, lighting, maintenance of public spaces, and control of the territory by patrols, *(ii)* community prevention measures, refining the maintenance and entertainment of community areas and public green areas, increasing the responsibility of businesses that face public areas, and refining neighbourhood watch, creating a spirit of mutual trust and cooperation among residents, then, *(iii)* social mediation and prevention initiatives, especially when children are the most involved in urban conflict dynamics, and *(iv)* harm reduction interventions in circumstances such as drug addiction and prostitution.

Another essential dimension in the evaluation of the context in which implementing a security program is the economic and employment dimension. Indeed, locating and identifying the companies that operate on the ground and knowing their history is a way to understand which security dynamics prevail and which risks of criminal infiltration require careful monitoring. Following these considerations, a lively and bustling entrepreneurial and commercial territory easily captures the attention of criminals, thus requiring greater security interventions. When there are many enterprises,

[96] Changes in the number of resident population in relation to births/deaths.
[97] Variations in the number of resident population in relation to migration/emigration.
[98] To be understood as the percentage of residents in social housing, eviction proceedings, and squatting.

it is necessary to follow the changes in ownership structures and the presence of foreign businesses. Then, other important data that influence, positively or negatively, the phenomena of urban insecurity are the rate of employment and unemployment, as well as the rate of activity or inactivity.

Another background to consider for effective urban security policies is the urban-environmental one. Indeed, security conditions can vary according to urban planning. Large mono-functional spaces, namely those that serve only one function, such as offices, have a low population density that increases the risk of isolation. However, even multifunctional environments, such as large residential areas, can generate problems of legality and security.
Additionally, even the conditions of infrastructures and their availability contribute significantly to circumstances of insecurity[99].

Other indispensable data for the elaboration of urban security policies are those on crime, which generally originate from crimes reported to the judicial authority, its investigations, and the surveys of the relevant ministries.

Equally important is evidence of urban disorder, which can have both a social and a physical dimension. The first has to do with an incompatibility between citizens, disturbing presences that instil fear and alter the sense of cohesion, situations of violence, and difficulties in the residential areas and schools[100]. The physical dimension of social disorder, on the other hand, has to do with what is tangible in urban space and what has a negative impact on our sense of security. Therefore, we talk about the degradation of facades, the state of maintenance of roads and facilities, lighting and presence of video surveillance, the condition of waste, and cleanliness.

As already considered, very often, these measures cannot be carried out solely and exclusively by local authorities, so collaboration with law enforcement agencies operating at the national level facilitates the creation of joint plans and programming that pave the way for more structured interventions, which in some cases can even go as far as modifying the administrative regulations governing collective life.

However, regardless of the nature of the authorities in the front line, be they the municipal police or the national police, any urban security intervention, in order to succeed and generate positive outputs, must necessarily be the product of the synergy between different professionals (for example, social workers, employees of local technical offices, architects and sociologists) who must be adequately

[99] Just to mention adequate city lighting, accessibility of urban transportation, traffic levels, absence of segregated areas, quality and integrity of housing, presence of services on the territory.
[100] As bullying might be.

trained, able to plan concurrent action plans and respect the same timeframe for implementation. All this may seem easy at a theoretical level and agreeable, but in the administrative practice, it is extremely complex as authoritativeness, political, and technical competence are required to assign certain responsibilities to the right people.

It is precisely on the point of the academic and practical training of stakeholders in the urban environment that we should stop and reflect. Knowledge and skills are the cornerstones of every profession and are essential elements to ensure the successful performance of job functions. Nevertheless, training never ends, and this is true in every field of work. Therefore, recalling the main theme of the paper, if we want to identify, implement, and live in urban models that ensure levels of security in all areas that affect our lives – economy, society, health, environment – we must continue, or in some cases begin, to invest in human capital. Having citizens trained, skilled, and aware of security issues, including urban security, is the *quid pluris* that allows having at disposal new professionals able to analyse and understand the dynamics of the territory, develop *ad hoc* policies, implement, and monitor them actively.

With these experts and aware citizens, transforming a city into Smart or Eco will not only be easier, but it will be a process that will last over time, because every sector and every aspect of urban life will be considered, analysed, and incorporated into the principles and standards that these two innovative models of urban life enucleate. Furthermore, thanks to these professionals, it will be possible to elaborate strategies to respond to specific problems of territorial insecurity, which change continuously in space and time. Thus, the so-called best practices can be identified and implemented, keeping in mind that each urban context has similarities and differences to another, so, although there are urban security policies of wide and general scope, there are also some more specific that respond to certain local cases and not always these can be extended to other city contexts, because very often the basic premises differ[101].

The competence and expertise of the actors called to manage situations of urban insecurity and ensure safety are elements that favour the application and identification of new methods to detect crimes, sanction offenders, and protect victims.

It is, therefore, appropriate to pause and reflect on what are known as conventional and predictive investigative methods, which characterize law enforcement operations. Conventional methods are generally manual, implemented without the support of innovative technologies, and are appropriate

[101] Further information available at Braccesi, C. (2016). Sicurezza urbana: il fenomeno, le politiche, i progetti. Forum italiano per la sicurezza urbana.

when limited and simple data are available. In contrast, predictive methods[102] are suitable for situations of greater complexity and more information to be examined, to the point that they offer the basis for the realization of the so-called intelligence-led policing or predictive policing (strategies to prevent crime under theories elaborated from the available data).

There are four categories of predictive methods used by law enforcement agencies: *(i)* methods for predicting crimes, i.e., to forecast where and when an increase in crime will occur, spaces are mapped and hotspots, namely areas with higher concentrations of criminal phenomena, are identified; *(ii)* methods for predicting offenders, used to assess who is more likely to commit future crimes; *(iii)* methods for predicting the identity of offenders, i.e., the creation of profiles that coincide with probable offenders with specific criminal records; and *(iv)* methods for predicting crime victims.

To carry out this type of work, law enforcement officers need adequate mapping software, and numerous are the examples: in Italy, there is KeyCrime, in Germany and Switzerland Precobs, in the Netherlands the Criminality Awareness System, while in the United Kingdom and in the United States PredPol is the one used.

2.3 Urban security policies in Italy

2.3.1 Historical excursus in the legislative field

In order to understand how urban security policies are conceived and implemented in Italy today, it is necessary to frame the topic in a broader context. In the following pages, therefore, it will be possible to identify some historical references concerning the evolution of the legislative context that led to the creation of principles and guidelines that have to do with urban security policies.

On the initiative of regional authorities committed to defining a response to local crime phenomena in the 90s, urban security began to develop in Italy. Between 1992 and 1995, there was an initial moment defined by Selmini as a period of "awareness and acculturation", which focused on the role of local autonomies in the area of social order and conflict. Therefore, the first projects of security policies were born, mainly in Northern Italy, to improve the quality of citizens' life by intervening on disorder and crime.

[102] Predictive methods generate predictive policing actions, namely analysis and application of statistical methods to prevent and anticipate crimes through the combination of different types of data, including reports of previously committed crimes or profiles of suspects.

On this impulse, the *"Città sicure"* project[103] was subsequently conceived, to bring attention to security issues at the level of regional and local government. In 1996, the *Forum Italiano per la Sicurezza Urbana (FISU)* was founded, an association that brings together cities, provinces, and regions to coordinate and draw guidelines on local security policies, and in 1998 the first Protocol of Understanding on security between the mayor of Modena and the prefect was born, opening the season to other agreements of the same type.

Then arriving at the early 2000s, the phase of "development and diffusion"[104] of security policies began, strongly requested by citizens because the topic acquired significant political weight, especially during electoral campaigns, for the direct election of mayors, and for the inhabitants' request to live free from insecurity and fear. Therefore, to guarantee the right interventions, new partnerships and institutional collaborations have been created, facilitating *ex-ante*, mid-term, and *ex-post* research activities so as to outline the best possible interventions, contemplating, above all, those of prevention.

Until 2007, these projects designed to increase urban security were extended and consolidated, mainly thanks to regional legislation that laid the groundwork for supporting security policies. The first region, then followed by others, to formulate this framework was Emilia Romagna, promoting "orderly and civil coexistence in cities and the regional territory" through *(i)* the strengthening of the system of relations between the Region, local administrations, and State institutions responsible for security, *(ii)* the re-elaboration of regional policies on account of security, *(iii)* the creation of a fund to provide financial support to local authorities in the implementation of projects on the subject, *(iv)* the provision of funds to associations and voluntary organizations that support victims of violence and crime, and *(v)* the increase in coordination between local police forces[105].

As previously stated, even the security policies in Italy have embraced an integrated approach, resorting to urban planning measures, redevelopment of decaying areas, conflict mediation, social prevention, education to legality, and assistance to crime victims, as the same regional laws have repeatedly stated. This change in legislation has to be understood within the broader framework of the reform of *Titolo V* of the Constitution[106], which included the transfer of new competencies, previously national, to the regions, and the maintenance of other functions in the hands of the state.

[103] From the Emilia-Romagna region.
[104] Selmini, R. (2014). Origine, sviluppo ed esiti delle politiche di governo locale della criminalità nell'Italia contemporanea in Corradini, F. (2014). Dalla città all'Europa. Strategie di sicurezza urbana, Edizioni Nuova Prohmos, pages 27-30.
[105] Confront note 102.
[106] Through constitutional law 18 October 2001, n. 3.

Among the first experiments to foster this collaboration, there were the *Protocolli d'intesa* and the *Accordi di programma*, which in practical terms facilitated joint training between the *Carabinieri*, State Police, and Municipal Police, the creation of joint inter-force operations rooms, the rationalization of the control of the territory, and the collection of data on crime and incivility. However, with the advent of the financial crisis, the allocation of public resources has undergone a sharp contraction, even in the area of urban security, and so new projects have been pursued with difficulty, some of them entailing only "*naïve*" measures such as the basic use of video surveillance or mayor ordinances.

This is demonstrable through the Pacts for Security (2007) whose goal of "intervention in areas of degradation and illegality" is managed primarily at the national level, and then spills over to the local area. Selmini specifies how at the ministerial layer the government establishes priorities, contents, and implementation methods for the pacts, then leaving the regions and municipalities with an auxiliary role[107].

There is then another noteworthy intervention, namely the *d.l. n. 14/2017*, that refers to urban security intending to guarantee it in an integrated way[108] and that establishes the creation of new prevention measures thanks to the new functions in charge of the mayor and the quaestor[109]. A more specific analysis of this measure will be provided in the 2.3.3 section.

2.3.2 The practice of institutional collaboration

Over the years it has been proven, both in Italy and abroad, that in the field of security policies – including urban security – institutional collaboration is essential, also given the existing constitutional provisions. A clear reference is article 118 paragraph 3 of the Constitution, which attributes to the ordinary law powers of coordination between the state and the regions in matters of competence enshrined in article 117, paragraph 2, letter *h*, that is, "exclusive legislative power to the state in matters of security and public order".
To this normative statement are then added the competencies of the local authorities, in which the mayor is entitled to powers of government (article 54 of the *Testo Unico degli Enti Locali*, *TUEL*)

[107] Selmini, R. (2014). Origine, sviluppo ed esiti delle politiche di governo locale della criminalità nell'Italia contemporanea in Corradini, F. (2014). Dalla città all'Europa. Strategie di sicurezza urbana, Edizioni Nuova Prohmos, pages 33-34.
[108] Implementing article 118 comma 3 of the Italian Constitution.
[109] Giupponi, T. (2019). Il "pacchetto sicurezza" e i rinnovati poteri del sindaco in materia di sicurezza urbana in Nobili, G. G., Giupponi, T., Ricifari, E., & Gallo, N. (Eds.). (2019). La sicurezza delle città: La sicurezza urbana e integrata. FrancoAngeli.

and is recognized as the guardian of the welfare of the local community. Therefore, numerous are the actions of mayors to fulfil these duties: from prevention, contrast, and mediation of phenomena source of insecurity and social alarm, to measures of urgency and emergency.

Inter-institutional cooperation has undergone considerable evolutionary incentives from the 1990s to date. Initially, the *"protocolli d'intesa"* between municipalities and prefectures marked this collaboration (1998), then came the reform of the *Comitato Provinciale per l'Ordine e la Sicurezza Pubblica* and the institutional agreements promoted by the regions since 2000 to increase dialogue and coordination between the state and small administrative realities. It is also important to mention the regional laws on integrated security (1999-2008) which established security as a "common good, essential for the orderly and lasting development of civil coexistence".

Then, from 2007 to the present day, the season of *"Patti per la sicurezza"* has opened, namely agreements between the Ministry of the Interior and municipalities for the design and implementation of new security programs resulting from the joint contribution of different institutional levels[110].

Finally, the most recent regulation is the already mentioned *decreto legge 20 febbraio 2017, n. 14 "Disposizioni urgenti in materia di sicurezza delle città"*, which contributes to the creation of a model of transversal governance in the field of security, thus resorting to agreements between the state and regions, and pacts with local authorities (for urban security), as the *legge 18 aprile 2017, n. 48* in which it has been converted affirms.

With an eye toward urban *"Patti per la sicurezza"*, the cardinal principles are solidarity and collaboration between the mayor and the prefect to define the interventions necessary to guarantee security in a given territorial context, also considering the surrounding areas, as article 5 of *l. n. 48/2017* establishes.

Specifically, these interventions for urban security have different purposes, including *(i)* prevention and contrast of widespread crime with attention to areas of greatest degradation, also involving local networks of volunteers to work alongside the police and resorting to the use of technology to facilitate the monitoring of the territory and prompt intervention, *(ii)* promotion and protection of legality through initiatives to repress the many forms of illegal conduct such as the occupation of buildings and illegal trade, *(iii)* training, investment, and collaboration to promote values related to urban

[110] A success of these pacts can be identified in the fact that (i) they were signed by both right-wing and left-wing governments and administrations, (ii) they were signed by an administration that yield power to another with a different political perspective yet, they were however implemented, and (iii) they functioned even if the collaborations between local authorities at different territorial levels were not always politically homogeneous. For a more detailed analysis, it is possible to read Calaresu, M., & Tebaldi, M. (2015). Local security policies and the protection of territory: an analysis of the Italian experience (2007-2009). *City, territory and architecture*, *2*(1), 1-18.

decorum through cultural initiatives in schools, museums, churches, and other cultural venues, as well as in public parks, and the *(iv)* promotion of social inclusion, protection and solidarity.

Thus, it is possible to detect that, through *"Patti per la sicurezza"*, prevention practices, mostly situational, are outlined, alongside the use of technological systems such as video surveillance. Hence, what emerges is a clear desire for development in the *modus operandi* of establishing and guaranteeing security, as police forces and protocols of this kind are supported and implemented by technological devices.

To remark this, it is possible to identify the decision of the Ministry of the Interior that in the three years 2017-2019 period has made available financial resources for the municipalities that signed the *Patti* and that, according to the previously mentioned article 5, have committed to installing video surveillance systems to control the public spaces most exposed to degradation and crime. This decision is of immense value, as it has established a clear objective: to make urban security and related policies accessible to all, especially to small territorial realities[111].

The use of technological tools to view and monitor the territory is a strategy, both local and national, to increase security. Obviously, before installing cameras and sensors, a significant evaluation of the context in which they will be used must be carried out. Indeed, it is necessary to understand whether these tools will effectively be of help and instrumental in meeting the security needs of the urban space, and, therefore, whether the costs of installation and maintenance will be outweighed by the benefits in terms of reduced incidence of criminal phenomena and increased sense of security perceived by the population. Moreover, technological surveillance alone is not enough: it must always be accompanied and integrated by other preventive measures in order to have a real positive effect on the liveability and safety of spaces. Therefore, the installation of cameras must be accompanied by measures of urban rehabilitation and regeneration, maintenance of infrastructure, and enhancement of services.

In light of the above, it again emerges how imperative it is to adopt an integrated urban security perspective to achieve successful results in this type of public policy, and, considering the support that innovation and research offer through new technological equipment, it is clear that cities need to regulate and take advantage of them.

Therefore, we can identify a link between the Smart Cities model and urban security policies, noting how reliance on information technology tools and increasingly pervasive connections also requires coming to terms with new forms of insecurity, such as the protection of personal data, the way

[111] Ferraris, V. (2019). Comprendere la legalità e la sicurezza, page 21-22.

sensitive information is collected, managed and processed, respect for privacy, personal rights and freedoms, as well as accessibility and transparency. Moreover, investing in technology does not only mean spending on equipment, but it also means budgeting for maintenance and extraordinary emergency interventions, investing in personnel that must be trained and updated to ensure proper viewing and management of images, and establishing a collaboration between the state, local institutions, and private entities to find common strategies in urban security and public order. To ensure this last reference to institutional cooperation, *l.n. 48/2017* defined the ways and means to enable information exchange, common management of video surveillance systems, and interconnection between the operating rooms of national and local police forces, as well as the involvement of private stakeholders to provide and map technological tools made available for public safety[112].

On January 24, 2018, the *"Linee Generali per la sicurezza integrata"* were approved, implementing Article 2 of *d.l. n. 14/2017*. These general lines are fundamental for the implementation of integrated urban security policies, as they contain precise indications on the areas and tools of intervention to facilitate integration and cooperation of policies issued by different levels of governance and which, however, contribute to intensifying the security and well-being of the local sphere.

More precisely, the guidelines serve, in this context as well as in others, to outline a path to be followed so that the collaboration and the division of competencies between different entities can be coordinated and functional, without resulting in a chaotic activity incapable of bringing benefit to the phenomenon it aims to manage.

In this regard, to ensure a consistent collaboration between national police forces and local ones, principles and domains have been established.

First of all, the exchange of information between these two bodies is imperative, just as it is important to ensure the identification of common standards, the territorial interconnection of workspaces, and the regulation of the joint use of computer security systems for the control and mapping of the territory. Then, it is impossible not to mention incentives for the promotion of awareness and prevention campaigns, urban inclusion and regeneration programs that must be coordinated, as well as continuing education opportunities for local and state police operators[113].

[112] Ferraris, V. (2019). Comprendere la legalità e la sicurezza, page 52.
[113] Antonelli Vincenzo, (2018) "La sicurezza delle città tra diritti ed amministrazione", Padova, Cedam.
Gallo Nicola, Nobili Gian Guido, Ricifari Emanuele 8a cura di) (2019), La sicurezza delle città, Milano Angeli.

In this framework of collaboration, we cannot overlook the role of citizens. Many Italian cities, such as Bologna, Turin, and Genoa, have been creating and experimenting with projects in which the public sector co-designs and co-produces public policies, freeing itself from the mere role of service producer. In this way, public responsibility is manifested through the implementation of inclusive and transparent decision-making processes where citizens collaborate and obtain timely solutions to the problems they face. This is true in all areas of public policy, including security, an arena in which citizens are personally affected and for this reason are inclined to participate, even more, allowing themselves to be involved in public action by supporting local government in choosing appropriate solutions. The role played by these civil actors is full of value because they are bearers of knowledge, expertise, and experience to be valued. Moreover, with the recent pro-accessibility, transparency, openness, and e-governance turning points, promoting participation from below coincides with guaranteeing democratic control from the bottom over institutional activities and the allocation of public resources. Therefore, it is no coincidence that even when it comes to urban security policies, the attention is postulated on the relationships of subsidiarity not only vertical but also horizontal.

Resuming the definition of urban security as a "public good pertaining to liveability and urban decorum", under *d.l. n. 14/2017*, the concept of security is approached as a good shared, sought, and protected by the entire community.

Besides, when the decree-law was converted into law, the reference to cooperation with private parties was not omitted, rather added to that between the different levels of government (vertical subsidiarity). Therefore, the legislature recognized an intrinsic added value to urban security, namely, its ability to manifest itself through the involvement of voluntary citizens, associations, and entities (horizontal subsidiarity)[114].

This collaboration between municipal institutions and citizens can also be understood as a strategy to develop programs that increase the levels of real and perceived security, but also as a governance tool to demonstrate the concrete and widespread presence of institutions in the various forms of expression of citizenship. Over the years, many tools have been devised and refined to create collaboration between public administrations and citizens – in the field of security, we can think of participatory budgeting or participatory planning of public spaces – and the added value of these strategies is to combine the principle of vertical and horizontal subsidiarity with that of participation, transparency, and accountability.

[114] "The involvement of private actors contributes to the protection and preservation of urban furniture and greenery and the promotion of social inclusion and solidarity", as it is issued in article 5, paragraph 3 letter a) and c-bis) of the decreto legge 14/2017.

These three concepts are contained in the broader concept of open government, which requires public bodies to inform, listen, reassure, and accompany citizens on the choices of local authorities and to involve and enhance the role that citizens can play in security through prevention, active citizenship, and surveillance.

However, when addressing the issue of urban security policies in Italy, it is necessary to consider how legislation has gradually modified and increased the powers of local authorities.

There are indeed places of coordination such as the *conferenza unificata, patti di sicurezza, comitato metropolitano*, and other agreements, but the institutional subjects called to the forefront to promote and fulfil the function of guarantors of urban security are, basically, three: the mayor, the quaestor, and the prefect (to a minimum extent).

With regard to the mayor, the *l. n. 48/2017* has amended article 54, paragraph 4 bis of the TUEL, specifying that the measures implemented by the mayor in his capacity as a government official on urban security are aimed at

> "preventing and countering the occurrence of criminal phenomena or illegality, such as drug dealing and the exploitation of prostitution, trafficking in persons, begging with the use of minors and disabled people, or concerning the phenomena of abuse, such as the illegal occupation of public spaces, or violence, including those related to alcohol abuse or drug use".

In this way, the mayor can prevent and counteract the onset of criminal phenomena and can adopt ordinances, even urgent, to tackle situations of serious neglect and degradation of the territory, the environment, cultural heritage, decorum, and urban liveability, in order to protect the "tranquillity and rest of residents"[115].

However, powers of sanction and possible bans from certain urban areas are not vested in the mayor, but the quaestor[116].

[115] In this way, the mayor received an additional power to the ones of adopting ordinances in case of sanitary or public hygiene emergencies. this new power is the one of "ordinance" according to which the Mayor "as representative of the local community, in relation to the urgent need for interventions aimed at overcoming situations of serious neglect or degradation of the territory, environment and cultural heritage or prejudice to the decorum and liveability of the city, with particular reference to the need to protect the tranquillity and rest of residents, also intervening in matters of hours of sale, including take-away, and administration of alcoholic and spirits" can intervene.
[116] Riva, C. R., Cornelli, R., Squazzoni, A., Rondini, P., & Biscotti, B. (2017). La sicurezza urbana ei suoi custodi (il Sindaco, il Questore e il Prefetto).

2.3.3 An analysis of Decree Law n. 14/2017 turned into law n. 48/2017

The *Decree-Law n. 14/2017* was accompanied by a report by Minister Minniti in which security was defined as a "new public good to encourage the concreteness of rights".

This description refers to a vision that recognizes security as the socio-institutional condition that allows freedoms and rights, referring to the theories, mentioned earlier, of the "security of rights" and the "right to security".

Specifically, since security is understood as a public good indissolubly linked to the rights enshrined in the Constitution, not only the democratic system identifies itself with the guarantee of security, but the very removal of obstacles to security ensures that individuals can fully enjoy their rights[117] and the conditions of well-being that derive from them.

D.l. n. 14/2017 represented a significant breakthrough compared to previous "packages" because it specifically addresses measures aimed at the integrated management of territorial and urban security policies, strengthens the powers in charge of the mayor, and calls for forms of coordination between the state, regions, and local authorities to manage more easily and effectively integrated policies on the territory, thus satisfying the provisions of article 118, paragraph 3 of the Constitution.

To better frame it, it is possible to focus on its three main lines of action: *(i)* the elaboration of concrete measures to ensure integrated security and, after sixteen years from the reform of Title V, to implement the aforementioned article 118, paragraph 3 of the Constitution, *(ii)* new legislative definitions to reform the powers of the mayor in matters such as urban security, fight against degradation, and protection of citizens, and *(iii)* the design of new measures of personal prevention issued by the mayor and the quaestor to safely enjoy public spaces.

It is possible to analyse more in detail the lines of intervention encouraged by *d.l. n. 14/2017*:

(i) About the implementation of article 118, paragraph 3, of the Constitution, the article 1 of the decree-law regulates the "methods and instruments of coordination" between the state, regions, and local authorities in the field of "public policies for the promotion of integrated security", which must be conceived as the plethora of interventions carried out by the various levels of territorial governance to promote and implement "a unitary and integrated system of security for the wellbeing of territorial communities".

[117] Thus delineating a condition of substantial fruition of rights.

This reference to collaboration is not new in legislative practice: *l. n. 121/1981*, which reformed the public security administration, already called for co-operation between local administrations, just as *l. n. 65/1986* established, at the mayor's behest, to authorize collaboration between municipal police and state police, as was then reaffirmed by the D.P.C.M. of September 12, 2000 on the identification of financial, human, instrumental, and organizational resources to be transferred to regions and local authorities concerning administrative police functions, which ratified that the national, regional, and local arenas collaborate "on a permanent basis" to pursue "optimal conditions of security of the cities and the extra-urban territory[118]"

Besides, the prefect could invite, when topics of general interest were discussed, the heads of the local authorities to participate in the meetings of the provincial committee. This opportunity then became a practice that prompted the legislator to modify the composition of the committee, including the mayor of the capital city and the president of the province. *L. n. 296/2006* recognized the legitimacy of the stipulation, by the Ministry of the Interior or the Prefects, of conventions with regions and local authorities that can help increase police services. Between 2007 and 2008, agreements were signed between the Ministry of the Interior and the ANCI council of small municipalities to promote operational measures to control the territory and forms of synergic intervention to improve the quality of life in urban centres.

In doing so, according to what Giupponi has highlighted[119], a "plural vision of security" understood as a public good to be realized in an "integrated manner" has finally been affirmed[120]. That said, *d.l. n. 14/2017* provides a series of tools to coordinate and ensure integrated security by involving multiple institutional actors. These measures aim to facilitate information exchanges, connect operational rooms at the territorial level, and provide adequate updates and professional training. These are the "general lines" under which state and regions (as well as autonomous provinces) can agree and provide integrated security on the territory, and mayors and prefects (in the local dimension) can stipulate the "pacts for urban security" and thus prevent and combat crime phenomena through the involvement of volunteers and video surveillance systems, protect and

[118] As well as for the realization of specific projects of modernization and technical-logistical strengthening of the structures and of the supplementary services of security and social protection, to the interventions of damage reduction, to the education to coexistence in respect of the legality, according to article 7, first paragraph, of the D.P.C.M. of September 12, 2000.

[119] In the work Giupponi, T. F. (2017). Sicurezza integrata e sicurezza urbana nel decreto legge n. 14/2017. *Istituzioni del federalismo: rivista di studi giuridici e politici*, (1), 5-29.

[120] As claimed by V. ANTONELLI, L'esperienza dei "patti per la sicurezza" nel triennio 2007-2009, cit., p. 164.

increase legality, deterring illegal behaviour, encourage the value and respect for urban decorum, and promote social inclusion.

With this in mind, it is possible to understand how urban security is interpreted by the legislator as a fundamental element that guarantees integrated security and, for this reason, brings together, in a spirit of collaboration, all levels of government and their competencies[121].

(ii) With reference to the second area of intervention that concerns the scope of the mayor's powers to issue ordinances, the decree under review better identifies, in line with the requirements of sentence *n. 115/2011* of the Constitutional Court, the conditions and areas of intervention, referring, however, to the security package of 2008, partially illegitimate[122]. *D.l. n. 14/2017* seeks to outline more precisely the area in which the mayor can intervene – as a government official – in matters of urban security, in harmony with what has already been established by article 117, paragraph 2, letter h) of the Constitution[123]. To ascertain the circumstances in which the mayor has the opportunity to intervene as a representative of the local community, it is possible to consult article 8 of the decree-law[124], which draws attention to the dual nature of the mayor's interventions: government official (in issuing contingent and urgent ordinances to prevent violence) and representative of the local community (to protect the rest and peaceful living of the community). However, a criticism, that many scholars have made to this enlargement of the competencies and powers of the mayor, concerns the difficulty of defining punctually the "phenomena of abusiveness", the events of "illegality" and the concepts of "urban liveability", "tranquillity of residents", and "urban decency". Indeed, an imprecise definition means that the mayor might have a wider margin of manoeuvre to intervene in the most disparate circumstances, with no limits to discretion. Moreover, another problem highlighted by the most distinguished researchers is that the boundary between the mayor's ordinary measures and municipal regulations is not only complex to be recognized, but it tends almost to overlap, making it difficult for the City Council to maintain its traditional regulatory powers[125].

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[121] Giupponi, T. F. (2017). Sicurezza integrata e sicurezza urbana nel decreto legge n. 14/2017. *Istituzioni del federalismo: rivista di studi giuridici e politici*, (1), page 14.

[122] For more information it is possible to consult the paper mentioned in the note above, from page 15 onwards.

[123] The State has exclusive legislation on "public order and security, excluding local administrative police".

[124] "In relation to the urgent need for interventions aimed at overcoming situations of serious neglect or degradation of the territory, the environment and cultural heritage or prejudice to the decorum and liveability urban, with particular reference to the need to protect the tranquillity and rest of residents, also intervening in the matter of hours of sale, including takeaway, and administration of alcoholic beverages".

[125] Giupponi, T. F. (2017). Sicurezza integrata e sicurezza urbana nel decreto legge n. 14/2017. *Istituzioni del federalismo: rivista di studi giuridici e politici*, (1), page 21.

(iii) The third vector of intervention and innovation has to do with personal prevention powers in the authority of the mayor and quaestor. Indeed, two measures have been introduced by the decree under scrutiny, such as the *"ordine di allontanamento"*, which is the responsibility of the mayor (according to article 9, *d.l. n. 14/2017*), and the *"divieto d'accesso"*, which is the responsibility of the quaestor (pursuant to article 10, *d.l. n. 14/2017*).

These two measures aim to protect the so-called vulnerable places – be they airports, railway stations, ports, schools, stadiums, artistic complexes, and urban green areas – going beyond the typical administrative fines to those whose conduct "impedes the accessibility and enjoyment" of these environments and infrastructures. Indeed, if the individual is guilty of drunkenness, acts in violation of public decency, trade, or illegal work not only faces a fine but by order of the mayor is expelled from the places where the fact was committed. As an additional measure, if such behaviour should be repeated and continue to endanger the safety of others, the quaestor, employing a motivated decision, may prohibit the individual, for a period not exceeding six months, from accessing the place where he has manifested this conduct detrimental to public safety. Nevertheless, the prohibition of access could also be a judicial measure of prevention, with a duration varying from six months to two years, adopted by the quaestor, whose request for validation by the judge must be presented by the public prosecutor.

Finally, it is useful to note that the two measures in the hands of two different authorities are not independent, since the mayor must transmit a copy of the removal order to the quaestor[126] and the latter, in the case of a ban on access, must establish how the subject will be able to move compatibly with health and work reasons[127].

As a matter of fact, with *d.l. n. 14/2017* then converted into *l. n. 48/2017*, an even more concrete impulse was given to the realization of an integrated governance model in which the different territorial entities with their skills exercise a form of control, promotion, and safeguarding of security in the cities, being mindful of the concrete needs of the residents. Therefore, the joint actions deriving from the different levels of government have been recognized by the legislature as the key to integrating knowledge, resources, and active measures in the field of urban security and public order and safety. With this approach, it has been inaugurated a path to promote security beginning with measures established by the state, regions, and local authorities in line with the broader concept of

[126] Article 10, paragraph 1, d.l. n. 14/2017.
[127] Article 10, paragraph 2, d.l. n. 14/2017.

the welfare state, active citizenship, requalification, and protection of the urban environment, strengthening of civil coexistence and prevention.

Public policies for urban security that embody all these different aspects are more likely to develop and function optimally in urban contexts where these values are recognized and protected through innovative techniques. Therefore, it is possible to believe that in the broader framework of Smart Cities and Eco-Cities, this integrated and collaborative approach towards urban security would be facilitated and amplified in its strengths.

2.4 The need for urban sustainable security and the emergence of "Urban Ecological Security"

As it has emerged from the previous paragraphs, even and above all local authorities are called upon to respond to the need for security that is a direct result of forms of unease, social discomfort, and urban life. To ensure this perception and condition of security the interventions are multiple and urban policies are very often oriented towards initiatives that can increase the social quality of life and, today, under the premises presented in the introduction and the first chapter of this paper, many policy responses embrace the concept of sustainability, guiding us toward a change: we must necessarily reverse the trend of climate degradation and the insecurities that it generates in all policy areas.

Therefore, there is a link between urban security policies and sustainability, because if sustainability aims at achieving sustainable development of human and social capital, this goal cannot be achieved except in an environment characterized by security and, likewise, ensuring security is not possible except through policies that aim at the evolution and promotion of sustainable development. These two elements are united, depend on each other, and are the premise of each other.

In a more official form, the commitment of local administrators to the pursuit of sustainable development as a prerequisite for well-being and quality of life in the city was manifested as early as 1992, during the Rio Congress, when the programmatic document Agenda 21 was created and approved. According to Chapter 28 of the document, Local Agenda 21 is to be implemented through "consultation between local governments, the general public, local organizations, and private companies".

In this thesis, the reference to Agenda 21 is consistent with the topics studied because it contemplates the theme of security, broadly understood as liveability and quality of life of citizens. This is why

local authorities are called upon to design security policies that cover both the social and sustainability sectors.

Indeed, there is a "sustainable urban security" that can be achieved through specific policies provided that we abandon the utopian idea of a "safe city" in all and for all, through the use of measures inspired by the theory of zero tolerance. The true policies of urban security and security governance with the potential to generate positive effects and spill overs in multiple sectors are those that take into account the complexity and heterogeneity of the context in which they operate, considering the social, traditional, historical, cultural, political, economic, and criminal traits of the territory in order to then ensure security.

This form of security should be considered sustainable with, for example, the ways in which the use of technology to monitor public sites are coordinated and mitigated by the protection of privacy, or by virtue of the creation of groups for observation, research, information, and documentation that, like a task force, would conduct a context assessment and then facilitate the identification of the best security policies[128].

The promotion of these urban security policies would be facilitated if cities themselves were designed to be or present the typical characteristics of Smart-Cities and Eco-Cities, not only for the use of integrated technology but also for the synergy between forms of interaction and vertical and horizontal subsidiarity, the proximity of services in the areas where there is the greatest need. Precisely, it is necessary to start thinking of cities as places of interconnection between people, security, and well-being, and it is from this perspective that local governance of security will be able to guarantee it as a condition that allows individuals to "feel secure and guaranteed in the exercise of all their rights: the right to life, the free development of personality, the right to quality of life[129]".

An additional consideration to be taken is that sustainable security in cities is a concept linked to the one of Urban Ecological Security, intended as the need to develop urban strategies to redesign cities and their infrastructures in order to guarantee the "ecological security", namely the flows of ecological resources, infrastructures, and services at the broad level.

[128] This system has been put into practice in Tuscany region with the regional law n. 38/2001, as it emerges from Cazzola, F., Ruggeri, F., & Coluccia, A. (Eds.). (2004). *La sicurezza come sfida sociale*. F. Angeli.
[129] PAVARINI M. (1998): "Introduzione" a "La Sicurezza nelle Città", in "La sicurezza in Emilia Romagna", Quarto rapporto annuale 1998, in "Quaderni di città sicure", 1998, 14.

Then, from this logic, as the research by Hodson and Marvin highlighted, a new logic appeared: the one of Secure Urbanism and Resilient Infrastructure (SURI)[130].

More in detail, to review these new perspectives having a practical impact on the urban universe, it might be of help to consider the overall conditions that cities are facing nowadays. We are living in an era of mega-trends – globalization, digitalization, resource constraints, climate change, and pandemics – that influence the premises for economic growth, which to date has to be sustainable in financial, social, and ecological terms, operating not only at the global and national level but even at the local one. Cities are, indeed, involved in harsh competition and must *secure* production and consumption of goods, as well as the proper living conditions of the urban population.

Acknowledging this, when approaching the wide theme of urban security policies, we should take a look at the paradigm of urban ecological security and its implications. It started to emerge in the urban research community after the 9/11 event in the United States, as a consequence of the re-thinking on national security about the "critical infrastructures" in cities, that are exemplified by energy, water, telecommunications, and transportation.

If previously reasoning on the identification of methods to protect and ensure the operation of these infrastructures despite risks such as terrorism, bioterrorism, cyberterrorism and natural disasters could be enough, today the perspective has expanded to include considerations related to ecological security, diverting attention to how to protect the urban environment and its key infrastructures in a framework characterized by other risks such as degradation, resource scarcity, energy, water and health security, demographic changes and the impact of migration and its deeper drivers, and increased competition between sectors, cities, and nations.

In this way, states have begun to postulate the attention and include in the political agenda the transversal theme of ecological security, yielding to territorial authorities the duty to enucleate it in well-functioning policies. To better understand why urban centres are the real protagonists of policies related to urban ecological security, it is appropriate to consider the following four points:

(i) Understanding climate change and the problems it brings in terms of security, cities are to blame as they are primarily responsible for high levels of pollution and depletion of natural resources; however,

(ii) Cities are also the principal victims of the adverse effects of climate change;

[130] Hodson, M., & Marvin, S. (2009). 'Urban ecological security': a new urban paradigm?. *International Journal of Urban and Regional Research*, *33*(1), 193-215.

(iii) It is in the urban fabric that, due to its characteristics, it is possible to research, develop and apply new policies to ensure and reconcile security and sustainability[131]. Moreover, the more sustainability- and security-oriented investments are made in a city, the more attractive the city becomes to local and foreign investors, ensuring economic growth;

(iv) Laws themselves are changing and moving toward increasing the powers of local authorities to lead comprehensive urban renewal projects.

That said, it would be appropriate to think in terms of Smart Cities and Eco-Cities as models and urban structures that can identify preventive strategies to make cities safer and accelerate the implementation of responses to existing situations of urban and climate insecurity, as they possess resources, guidelines, and well-defined strategies that, if combined with intelligence and profitable investments, can lead to optimal results in overcoming fear, risks, and dangers.

To give some examples, thinking about the need to protect cities from the negative impact of climate change and the reduction of resources useful to the population well-being, dealing with a Smart City would allow using advanced technologies to measure – in a given time frame – the impact of climate transformations (temperature rise, flood risk, water scarcity) on essential goods, generating an immediate response in terms of change or adaptation of existing infrastructures.

Some cities that have already invested significant portions of public money in programs to analyze and implement preventive responses to future urban security risks are, for example, London, New York, and Washington, which have opted to implement infrastructure and strategies for targeted emergency response that would make the city resilient to adverse events such as flooding[132].

Furthermore, considering the attempts to make cities less dependent on external resources - mostly energy and food - all the efforts to re-localize and re-internalize are small steps that slowly lead to the realization of a bigger picture, which coincides with the development of Eco-Cities, which strategically organize or re-organize to be self-sufficient in the use of essential goods and services from sectors such as energy, water, food, waste, and mobility. This tactic of abandoning dependence on external states or infrastructures, already realized by many Asian and Western cities (such as London, San Francisco, and Melbourne) coincides with the reduction of economic and environmental costs, as well as with the desire to re-value local resources in order to ensure new forms of sustainable and safe urbanism, thanks to more resilient infrastructures and services.

[131] This is the case of experiments in sustainable mobility to reduce emissions of health-damaging gases and reduce the resulting injuries and deaths.
[132] The concept of resilient city will be discussed in the final part of this paragraph.

It is also important to consider how the creation of Eco-Cities not only aims to involve professionals such as engineers, urban planners, and architects to create a more autonomous city, but also to promote sustainable development on multiple fronts: ecological, social, economic, cultural, and security. Indeed, as reported by the best practices of the C40cities, the goal of a sustainable city "is to be as close to carbon-neutral as possible, with city vehicles that produce no carbon or particulate emissions and highly efficient water and energy systems". However, to achieve this goal, it is a priority to emphasize the need for substantial investment to train the new employees of integrated and sustainable security, otherwise, all the goodwill and regulatory impulses that can be recognized in the rise of Smart Cities and Eco-Cities will be in vain.

What can be observed from the past few years' experience is that cities are mobilizing to demonstrate more and more the importance of their role in security and sustainability, developing networks and collaborations to give homogeneity to the strategies to be implemented, giving priority to the rediscovery of values and city-based resources, and putting into practice actions that aim to define a strategic security policy, to ensure not only the fight against crime but also the longevity of the city and its inhabitants.

This strategic protection is therefore carried out in response to climate change and allows for the reconfiguration of the socio-technological infrastructures of major urban importance. In concrete terms, it means, for example, decentralizing water, food, and energy storage systems and moving them from the regional or national level to the urban one, within the boundaries established by the metropolis. In doing so, it is an attempt to ensure greater urban control over the sources of supply of essential resources, developing local production, circular urban metabolism, and the so-called closed-loop systems, in order to ensure the autonomous development of the city without having to rely on systems of production or distribution of "external" goods, which can determine unexpected and problematic risks.

The idea of combining this strategic protection with elements typical of ecological security is remarkable and offers an opportunity for safe and sustainable development of all cities wishing to change their internal structure, their infrastructures, and the management of goods and services to be offered to their inhabitants. The key to a city's success in this endeavour is to focus attention on the long-term, recognizing that the modification of operational strategies in relation to the production, management, and distribution of certain goods must be oriented towards a broad and long-time spectrum, so as to ensure social and economic well-being within the broader framework of security. Therefore, the new logic is to "anticipate systemically and prepare strategically" for possible risks

and periods of scarcity of resources[133] using technical, scientific, and IT capabilities that can implement the principles of climate change mitigation, energy security, resource security, technological change, and the new priorities emerging from a local-centric economy.

In this context of reorganization and self-development for the realization of transversal policies of prevention, security, and well-being, new figures with a significant role are emerging. In part, it seems that the ability to involve new stakeholders from social groups, business, environmentalists, and city governments ensures development, innovation, and potential to the dynamics of urban ecological security, since these new partners establish priorities and objectives of the urban agenda, labelling climate change and security as key elements to be addressed in the pursuit of welfare, including economic. In doing so, the development of Sustainable Urbanism and Resilient Infrastructure (SURI) practices is guided, controlled, and legitimized by these heterogeneous actors.

The need for SURI-related policies and strategies stems from the necessity to secure a population - and therefore more generally a city, if not a region or a country - from resource scarcity and the negative consequences that this condition entails. This is why the urban agglomerations most attentive to climate change put in place strategies that can integrate attention to the environment, infrastructure, economy, and security, naturally optimizing the experiences, goods and services that these cities can offer, and becoming places desirable for companies and citizens to live and do business.

Consistently with this, in this closing part of the chapter, it would be appropriate to bring attention to a further concept that has emerged over the years, namely that of resilient cities and, consequently, resilient communities[134].

The concept of resilience refers to the effort to overcome adverse conditions without surrendering to them. Resilience is a process characterized by the adaptation and evolution of certain entities based

[133] Hodson, M., & Marvin, S. (2009). 'Urban ecological security': a new urban paradigm?. *International Journal of Urban and Regional Research*, *33*(1), 193-215, page 205.

[134] Attention to the concept of resilient community has also been given by the World Bank, which shares the definition of urban community provided by the Resilience Alliance in 2002, namely a community that "can absorb disturbances, change, reorganise, and still retain the same basic structures and provide the same services". The step forward that this institution has taken concerns the application of the concept of resilience to multiple arenas: infrastructural, institutional, economic, and social. Therefore, by infrastructural resilience reference is made to "a reduction in the vulnerability of built structures, such as buildings and transportation systems", "sheltering capacity, health care facilities, the vulnerability of buildings to hazards, critical infrastructure, and the availability of roads for evacuations and post-disaster supply lines". On the other hand, resilience intended in its institutional nature refers to the governmental and non- governmental systems that administer the community. The concept of economic resilience is linked to the "community's economic diversity in areas as employment, number of businesses, and their ability to function after a disaster", while social resilience takes into account "the demographic profile of a community by sex, age, ethnicity, disability, socioeconomic status, and other groupings, and the profile of its social capital", thus the ability of groups of citizens "to adapt and a sense of attachment to a place". Further information available at: Jha, Abhas K., Todd W. Miner, and Zuzana Stanton-Geddes, eds. 2013. Building Urban Resilience: Principles, Tools, and Practice. Directions in Development. Washington, DC: World Bank. doi:10.1596/978-0-8213-8865-5. License: Creative Commons Attribution CC BY 3.0.

on external and internal phenomena. Therefore, in the urban context, to speak of resilient cities and communities means to look at actors capable of absorbing and reacting to shocks different from each other, be they natural disasters induced by climate change, acts of terrorism, or chronic violence due to the presence of criminal groups in the urban fabric.

Furthermore, this city resilience could be understood as smart and sustainable when *(i)* the focus is placed on public spaces as arenas of insecurity or urban malaise, and not only on the actors of insecurity, *(ii)* initial strategies of resistance to phenomena of lawlessness are implemented by relevant members of the community, be they gatekeepers or those who constitute trust networks, and *(iii)* the use of technology is encouraged to the maximum, ensuring information sharing and not only surveillance[135].

[135] Armao, F. (2013). Smart resilience. Alla ricerca di un nuovo modello di sicurezza urbana, page 12.

Chapter 3: Smart Cities through the lens of security

3.1 Smart Cities: a model in quest of a definition

Every entity is bound to evolve because of internal and external changes.

The same can be said of cities, "living" agglomerations which, in order to continue to be neuralgic hubs of activity and opportunity, must guarantee accessibility and participation, solve problems such as environmental and technological risks, regulate the use of space, ensure legality and safety, guarantee technological and energy efficiency, and embrace the paradigm of the circular economy and sustainability on an urban scale[136].

The twenty-first century is defined as the "century of cities" and, from this perspective, the city of the future must be smart, namely devoted to the identification of strategies that allow for community inclusion, the creation of digital agendas, and well-developed policies also on the IT front. In this way, a process of urban reorganisation would be implemented to promote the re-functionalisation and redevelopment of certain public areas, the regeneration of environments to optimise their sustainable nature – through the exploitation of their social, landscape, and antipollution function – and the improvement of safe accessibility.

This smart city of the future is a model that already exists and can be observed in various parts of the world. It ensures the smart management of the urban universe, its resources and potential through integrated measures, new ways of controlling and monitoring urban and environmental phenomena, and new services to protect accessibility and usability of data. The rapid growth and spread of these Smart Cities are partly due to their ability to respond to the growing complexity generated by events such as globalisation (of the economy and culture), the crisis of representative democracy, the restructuring of the public apparatus, transformations in production processes, the development of new technologies, the loss of biodiversity, and the threats to the environment.

Today, these issues have to be approached and managed through information technology and digital communication, thus via the opportunities offered by the Internet.
This type of city offers a mix of services such as housing and employment in a context of increasing development and well-being, reduced land use, and sustainable mobility. Spaces are therefore reorganised and calibrated to new urban needs. This requires the intervention of architects and urban

[136] Moraci, F., & Fazia, C. (2013). Smart Cities and challenges of sustainability. *TeMA Journal of Land Use, Mobility and Environment*, *6*(1), 35-45.

planners whose work can bring out services such as social housing, sustainable neighbourhoods and mobility, spaces for social cohesion, urban safety, and citizen empowerment.

The core of this smart (and sustainable) city of the future (and of today) is no more than the innovative use of already existing strategies of management and service provision to make effective use of the resources and potential of the urban fabric, creating synergy between the macro and micro dimensions, focusing on issues such as energy-saving and smart buildings, security and redistribution of social benefits, all in line with the use and added value offered by new technologies.

In this way, the smart cities of the future will be able to guarantee – and where this urban paradigm has already been implemented, it guarantees – wellbeing and high quality of life, urban spaces that are close to the needs of the community, greater connectivity and optimisation of time, assistance, accessibility and transparency for traditional public administration activities, reduction of management costs and their wastages, and collective and individual security.

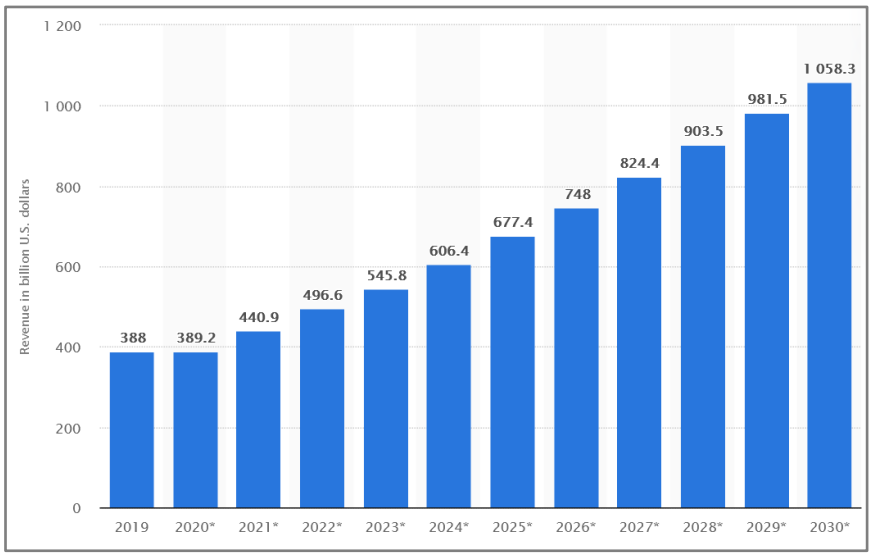
The benefits deriving from the urban model of Smart Cities increase competitiveness and urban visibility, prompting and ensuring spatial mapping, information gathering and dissemination, and networking of services and goods. Technology is used as a complementary tool to traditional urban activities, with the added value of simplifying and speeding up many processes: the creation of portals to facilitate purchasing and information retrieval, as well as the computerisation of sectors such as water, energy, and waste to handle the related services in full respect of the circular economy.

There are also many studies associating this urban model with economic growth which, from the perspective of ecosystem protection, can be considered sustainable[137].

In addition, Smart Cities can, through the use of the Internet of Things (IoT), diagnose and predict risks – environmental, technological, and individual – and ensure appropriate surveillance.
It is the IoT that drives the performance of Smart Cities, as it ensures their development, implementation of services, and operation.
In 2020 the IoT worldwide market was valued at around 389 billion US dollars, but it is expected to reach more than one trillion US dollars in 2030, as the graph illustrates.

[137] S. Dirks, C. Gurdgiev, and M. Keeling, "Smarter cities for smarter growth: How cities can optimize their systems for the talent-based economy," IBM Institute for Business Value, 2010.

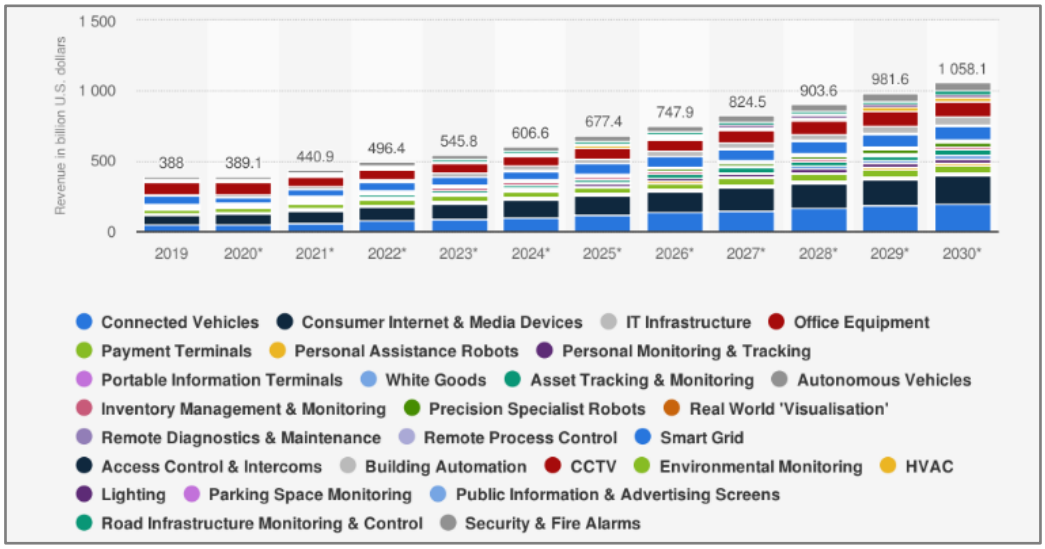
Figure 5. IoT total annual revenue worldwide from 2019 to 2030.



Source: Transforma Insights. (December 22, 2020). Internet of Things (IoT) total annual revenue worldwide from 2019 to 2030 (in billion U.S. dollars) [Graph]. In Statista.

This expansion in revenues also relates to the enlarging number of connected devices. The most common ones are smartphones, even if the global revenue deriving from smart vehicles, payment terminals, smart grids, smart buildings, CCTV, security, and fire alarms is expected to exceed 50 billion US dollars.

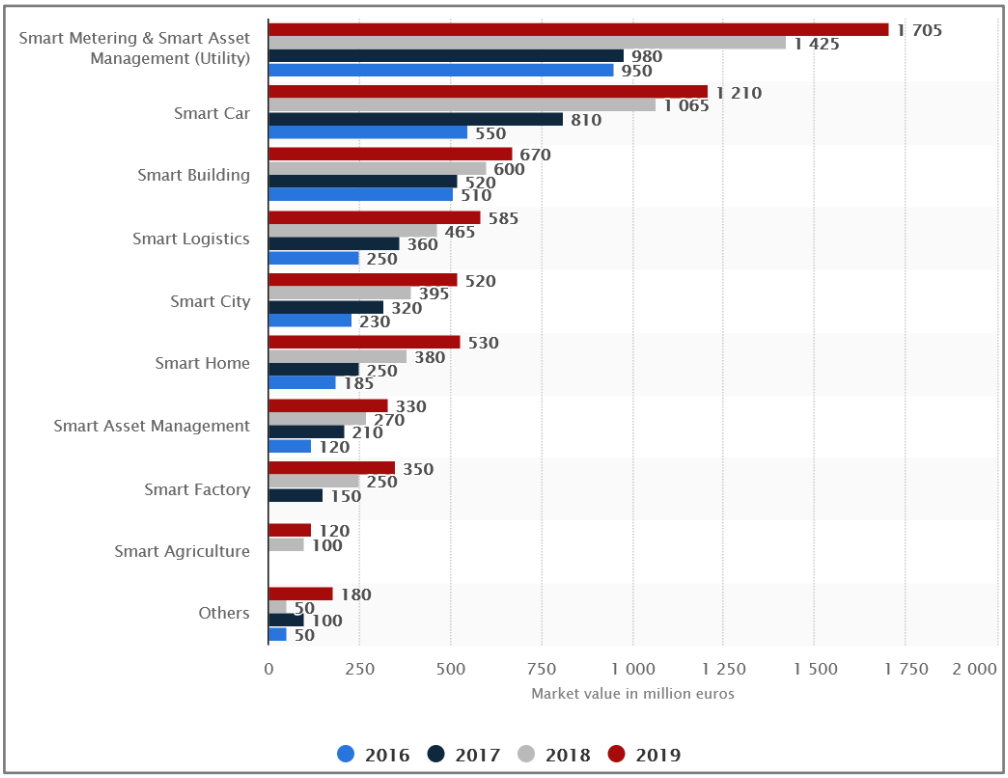
Figure 6. IoT annual revenue worldwide from 2019 to 2030 by use case.



Source: Transforma Insights. (December 22, 2020). Internet of Things (IoT) annual revenue worldwide from 2019 to 2030, by use case (in billion U.S. dollars), [Graph]. In Statista.

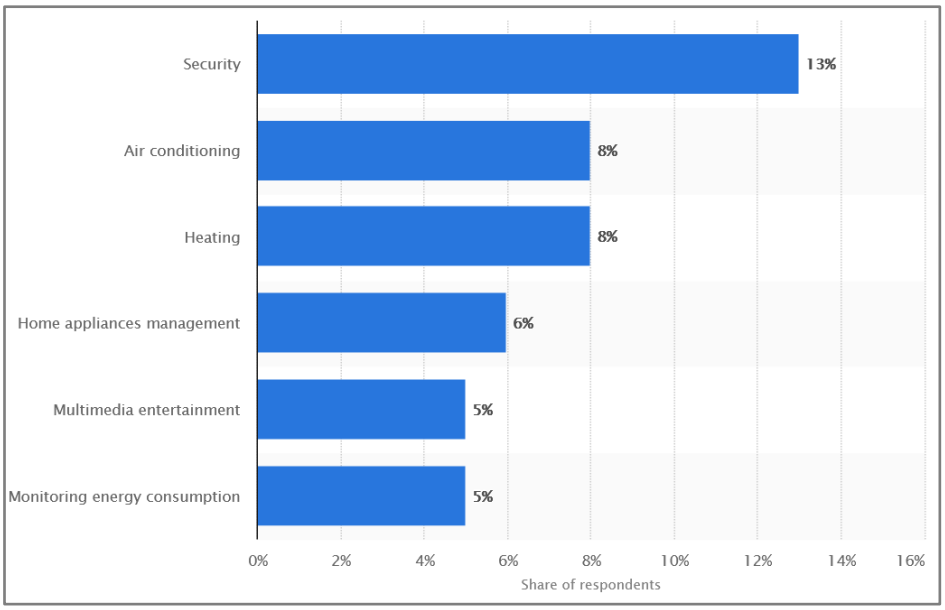
Concerning Italy, the market value of the IoT has been experiencing steady growth, with the Smart Home segment that duplicated its share, reaching 530 million euros in 2019, as figure 7 shows. As a consequence, investments in and installations of home security systems increased, consistently with data collected from a survey realised in 2016 (one in ten owners of IoT installed home security tools), as represented in figure 8.

Figure 7. Market value of Internet of Things in Italy from 2016 to 2019, by field of application.



Source: Osservatori Digital Innovation. (April 7, 2020). Market value of Internet of Things in Italy from 2016 to 2019, by field of application (in million euros) [Graph]. In Statista.

Figure 8. Answer to the question "For which functionality do you use the smart devices connected in your home?"



Source: Doxa. (February 23, 2017). For which functionality do you use the smart devices connected in your home? [Graph]. In Statista.

In the academic field, it is assumed that phenomena such as urbanisation, the advent of the IoT, and ICTs have led to the conceptualisation of the Smart City paradigm.

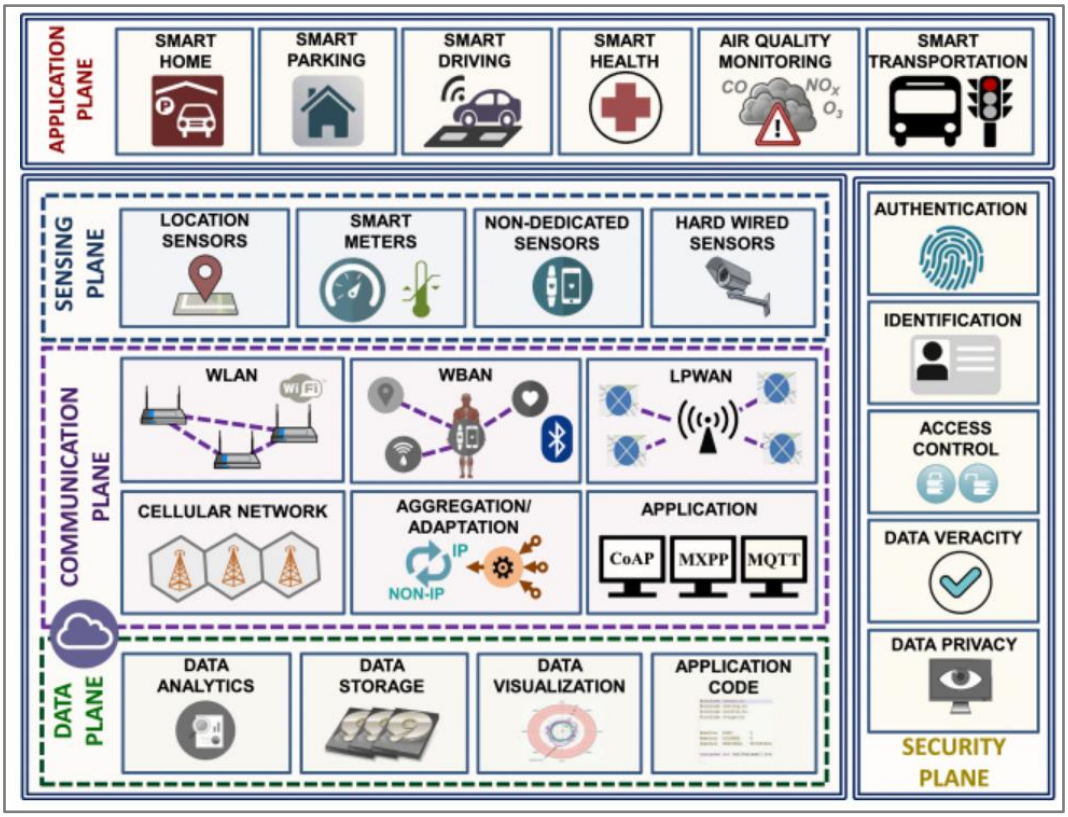
It should be emphasised that Smart Cities are urban models capable of ensuring the management and organisation of the city through technology, which is used in every sector that characterises urban life. Indeed, in infrastructures, education, health, governance, environmental protection, and security, cross-cutting integrated technologies[138] are employed.

When referring to the IoT, what comes to mind is a network of concrete, physical objects that relate to tools such as computers, software, electronics, and sensors that ensure interactions and connections between devices, makers, and operators[139].

To provide a visual reference to the different levels that make up the architecture of a Smart City, it is useful to refer to the figure below.

[138] Electronics, sensors, computerized systems of databases, tracking algorithms, and decision-making algorithms.
[139] The real innovation and appreciation that the IoT generates is given by the possibility to connect the physical world to the more "virtual" one through electronic devices.

Figure 9. A Smart City's general architecture.



Source: Habibzadeh, H., Kaptan, C., Soyata, T., Kantarci, B., & Boukerche, A. (2019). Smart city system design: a comprehensive study of the application and data planes. ACM Computing Surveys (CSUR), 52(2), 1-38.

Given that in Smart Cities the pervasiveness of technology embodies a wide range of urban services and activities (smart mobility[140], smart communication, smart governance[141], smart environment[142], and smart commerce[143]), they can be taken into analysis according to five categories: *(i)* application, *(ii)* sensing, *(iii)* communication, *(iv)* data, and *(v)* security[144].

Concerning the "application" section, it refers to the interactions between the Smart City and its users, thus providing tools to control and reduce resource misuse, enhance task automation, and foster the safety and security of the city through constant monitoring activities. To pursue these objectives the links between the users and the city are both direct, such as online portals and smartphone

[140] Transport and traffic.
[141] Government, security, health, infrastructures, smart grids, and education.
[142] Waste, water, energy, food, and soil management.
[143] Banking, finance, and Real Estate.
[144] According to the study Habibzadeh, H., Kaptan, C., Soyata, T., Kantarci, B., & Boukerche, A. (2019). Smart city system design: a comprehensive study of the application and data planes. ACM Computing Surveys (CSUR), 52(2), 1-38.

applications, and indirect, namely they rely on actuators that modify and control the citizens' living space.

Giving attention to the "sensing plane", it consists of sensing devices and actuators to compute physical signals[145] and interact with urban elements[146]. As they generally rely on wireless sensor networks, power availability might be a problem, but it is possible to overcome it through the use of green energy sources such as solar and wind energy, thus pursuing sustainability and significantly reducing maintenance costs.

Considering the "communication" layer, it is about pre-processing and gathering data deriving from the city sensor devices and connect them to the cloud in a secure way.

When it comes to data, what is fundamental to recall is that all the strategies dealing with them must accomplish two services, namely data processing and data storage. While the former consists of software with processing hardware that runs algorithms, the latter is about collecting, storing, and creating databases for raw data and processed one[147].

Lastly, considering the security layer embedded in the architecture of a Smart City, given the possibility of breakthroughs in the IoT system, it is imperative not to neglect security and privacy matters, as cyber-attacks can be driven by the intent of extorting money, as well as destroying critical urban infrastructures thus debilitating the economy of the city and endangering residents' lives.

To counter this contingency, city governors and law enforcement authorities must idealize and create a security plan that engages all the components of the Smart City structure, otherwise, the weakness of an element might be exploited by hackers as a door to enter the whole system.

According to these insights, it is however very complex to identify a precise and universal definition of the "Smart City" since this concept is still in the making and is still subject to debate. In general terms, a Smart City uses digital and ICT-related tools to ensure more efficient urban public services – thanks to technological innovation – and, consequently, to increase the competitiveness of the city, its visibility, and attractiveness, as well as its overall economic growth[148].

[145] Humidity levels, acoustic pollution, GHGs emissions, environmental irradiations, and so on so forth.
[146] Such as city lights or CCTVs.
[147] To succeed in data processing and storing, three different algorithmic modules are necessary: (i) data-analytics strategies, such as cluster analysis, correlation and regression, to extract useful information from massive raw data samples, (ii) machine-learning, namely algorithms that foresee future events consistently with the premises deriving from data collection, and (iii) data visualization techniques, responsible for sharing the results of data-analytics and machine-learning to the public.
[148] Digital technologies are implemented as a part of business processes, together with labour, capital, and knowledge capital assets, to drive performance.

The OECD has defined Smart Cities as

> "initiatives or approaches that effectively leverage digitalisation to boost citizen well-being and deliver more efficient, sustainable and inclusive urban services and environments as part of a collaborative, multi-stakeholder process".

Another definition that fully captures the "evolving" nature of Smart Cities comes from the UK Department of Business, Energy and Industrial Strategy, which recalls that the idea of Smart City

> "is not static: there is no absolute definition of a smart city, no end point, but rather a process, or series of steps, by which cities become more 'liveable' and resilient and, hence, able to respond quicker to new challenges"[149].

In the academic field, there are different possibilities to classify the smartness of a city. Specifically, one can find *(i)* technology-based, *(ii)* domain-based, *(iii)* integration-based, and *(iv)* data-based definitions.

More in detail:

(i) Technology-based definitions: the mere presence of ICTs is not enough to call a city smart. What is needed is the combined use of software, hardware, network technologies, sensors, and algorithms to improve services in strategic areas such as public administration, education, healthcare, public safety, real estate, transport, and utilities[150]. In this way, we can achieve a safer, more sustainable and efficient city, capable of looking after the needs of new generations without endangering their existence.

(ii) Domain-based definitions: in cities, there are many spheres in which different policies are pursued. In a Smart City, it is possible to identify the domains of smart government, mobility, education, environment, healthcare, and welfare. The main idea is that human and social capital interacting with ICTs increases opportunities for sustainable economic growth.

[149] The OECD Programme on Smart Cities and Inclusive Growth - OECD. (2020). Retrieved 3 May 2021, from https://www.oecd.org/cfe/cities/smart-cities.htm.
[150] Sánchez-Corcuera, R., Nuñez-Marcos, A., Sesma-Solance, J., Bilbao-Jayo, A., Mulero, R., Zulaika, U., ... & Almeida, A. (2019). Smart cities survey: Technologies, application domains and challenges for the cities of the future. *International Journal of Distributed Sensor Networks*, *15*(6), page 3.

(iii) Integration-based definitions: the presence of ICTs and IoT is not enough to make a city smart unless there is an urban interconnection of all the technological systems used by the municipality.

(iv) Data-based definitions: the attention is given to data gathering, management, transmission, safety, and use.

To better understand what it means to live in a Smart City, it is possible to interpret the synergy created between tangible assets (such as infrastructure, technology, natural and artificial resources) and intangible assets (the human capital, the intellectual capital of public administrations and private companies) as the means to optimise the services offered to citizens. In this way, technology is used to improve the already existing structures for the fruition of different goods and services.
Consequently, one can think of the Smart City as an urban model that refers to a vision, a manifesto[151] for the establishment of the ideal and sustainable cities of the 21st century, meaning functional, state-of-the-art, eco-friendly, and inclusive cities. Therefore, technology becomes instrumental in solving social, political, economic, ecological, managerial, and security risks or difficulties[152].
Thus, these are complex, extensive models, requiring substantial investment, but capable of leading the way towards more sustainable and safer lifestyles at a local level, which can then be replicated on a global scale.

3.2 Identifying the link between Smart Cities and Security

As fully discussed in Chapter 2, within the urban reality there are heterogeneous dynamics that produce significant differences in opportunities, be they social, environmental, or economic, depending on the area in which one resides. The more these differences increase, the more dangerous the phenomenon of urban insecurity becomes.

The concept of urban (in)security finds its place in the Smart Cities framework, as any smart city projected on the road to urban development contemplates the issue of security, providing the competent authorities with the means at the cutting edge of technology to ensure the safety of all inhabitants. Even more so, when we talk about IoT applied to everyday city life, the issue of security must be taken into account to ensure the usability of services without endangering users.

[151] Vanolo, A., 2014. Smartmentality. Urban Stud. 51 (5), 883–898.
[152] Yigitcanlar, T. (2016). *Technology and the city: Systems, applications and implications*. Routledge.

Certain urban planning and design strategies, combined with IoT and digital interconnections, provide an additional weapon to the many policies implemented by local authorities to combat insecurity. Of course, video surveillance cameras and drones are not enough. The integrated approach to urban security must be - and can, *a fortiori*, be – as such also in Smart Cities.

Therefore, it can be said that in a smart city, security interventions depend on how technologies are implemented in the "different realms of the urban environment[153]" they are "holistic", and their proper functioning and effective outcome depend on the smartification of all city services. In a broader perspective, one can well understand how much this implies the need for interconnectivity.

Consequently, this urban model contributes to offering and facilitating the implementation of a plurality of measures such as *(i)* the prevention of physical, economic, social, and environmental urban decay through citizen involvement in local governance, *(ii)* the improvement of the urban environment through architectural and infrastructural interventions, *(iii)* the increase of job and training supply, *(iv)* the guarantee of social inclusion and intercultural knowledge exchange, all through the use of information and technology tools. In this way, the sense of belonging to a place and a heterogeneous community is increased, and consequently, greater security is perceived, as public (and private) services aim to promote inclusion and collective welfare.

In general terms, although correct, one can support the idea that Smart Cities are a model and a concept born out of the trend of rapid urbanisation and the explosion of ICTs that have changed governance, planning, and security strategies in cities. Pursuing the smart model in local authorities means equipping urban agglomerations with tools to manage day-to-day activities and more: transport, waste management, food, water, and energy supply, health services, environmental protection, as well as crime prevention and security.

Concerning the issue of security, studies on Smart Cities have not always given it the attention it deserves.

Starting from the assumption that Smart Cities are urban models that aim to efficiently use ICTs to offer a plurality of services and counteract a plurality of threats and risks arising from urban dynamics, the issue of security cannot be considered marginal, given that safety and security are constitutive elements of a community's well-being and development. For this reason, it is crucial to include them in the planning phase of a Smart City and the study of these urban systems[154].

[153] Laufs, J., Borrion, H., & Bradford, B. (2020). Security and the smart city: A systematic review. *Sustainable cities and society*, *55*, 102023, page 24.

[154] Reddy, A. G., Suresh, D., Phaneendra, K., Shin, J. S., & Odelu, V. (2018a). Provably secure pseudo-identity based device authentication for smart cities environment. Sustainable cities and society, 41, 878-885.

Broadening the horizon and including a security analysis within Smart Cities, it is possible to steer urban development in a very specific direction: creating (Smart) cities whose characteristics offer immediate solutions and effective tools to guarantee urban security[155] also thanks to technology and the effective allocation of public resources.

In Hartama's words, a safe city

> "enhances the effectiveness and efficiency of the process of handling the threat of crime and terror, to enable the availability of a healthy environment for citizens, and access to health, [and] rapid response to emergencies",

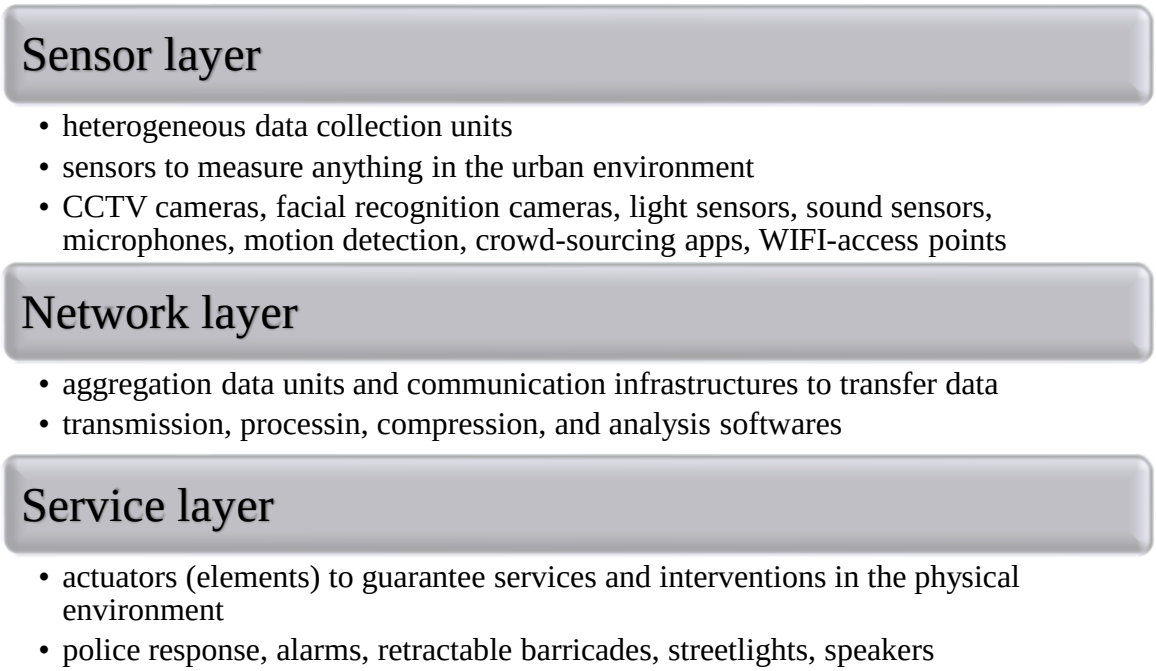
putting citizens at the centre, ensuring that their needs are met, guaranteeing that their perception of safety meets adequate standards, and making the city a desirable place to live and profit[156].

Each city has specific characteristics, due to the morphology of the territory and the citizens themselves who inhabit them, presenting different designs. When considering Smart Cities, the discourse continues to be true, although some basic elements are common to all cities that aspire to be defined as smart.

In order to classify these basic elements, a tripartition can be used. Indeed, three layers can always be identified in the architecture of Smart Cities: *(i)* sensor layer, *(ii)* network or processing layer, and *(iii)* service or actuator layer.

[155] Bourmpos, M., Argyris, A., & Syvridis, D. (2014). Smart city surveillance through low-cost fiber sensors in metropolitan optical networks. Fiber and Integrated Optics, 33(3), 205-223.
[156] Cagliero, L., Cerquitelli, T., Chiusano, S., Garino, P., Nardone, M., Pralio, B., & Venturini, L. (2015). Monitoring the citizens' perception on urban security in Smart City environments. Paper presented at the 2015 31st IEEE International Conference on Data Engineering Workshops.

Figure 10. Smart cities layers.



Source: Laufs, J., Borrion, H., & Bradford, B. (2020). Security and the smart city: A systematic review. Sustainable cities and society, 55, 102023.

On the basis of the information reported in the table and in line with the analysis of the link between Smart Cities and security, it is possible to understand how the technologies typical of these urban agglomerations are instrumental in guaranteeing prompt responses to situations of insecurity, as well as preventing manifestations of crime or violence. Therefore, crime-related elements can be found in every layer of the Smart Cities and, following the careful classification that emerges from the work of Laufs, Borrion, and Bradford (2020), security functions can be found in the typical infrastructures of the Smart Cities.

These are presented below.

(i) Detect: to ascertain the presence of anomalies.

(ii) Authenticate: to verify whether an individual is authorized to be in a specific place.

(iii) Identify: to recognise someone or the exact nature of a substance.

(iv) Locate: to figure out the location in which people considered as potential threats are.

(v) Profile: to classify individuals similar to the profile of an offender and check on them.

(vi) Track: to follow the movement of goods or individuals.

(vii) Defeat: to impede the offenders' access, movement, collection of information.

(viii) Disable/deny: to debilitate the offenders' equipment such as cameras or bugs.

(ix) Direct/deflect: to lead the offenders towards or away from certain places or behaviours.

(x) Deter: to explicitly inform offenders about the risks and consequences of their behaviours, thus inducing them to avoid criminal actions.

(xi) Discourage: to prove the reward of the criminal action as too little compared to risks and dangers, thus tempting the offenders to abandon their intents.

(xii) Demotivate: to present a negative image of the offenders, contrary to how they perceive themselves.

(xiii) Mislead: to deliberately share wrong information with the offenders (on behalf of intelligence activities and joint force collaborations) to arrest them or prevent them from committing crimes.

(xiv) Disconcert: to create unexpected discomfort among the offenders, startling them and inducing them not to follow their criminal scheme of action.

(xv) Detain: after detecting and identifying the offenders, they have to be caught.

(xvi) Inform: to share data and call for additional support armed units to intervene.

(xvii) Manage: to take care of financial, physical, and technological resources needed for the crime-related operations, tasking allocations, and scheduling.

There is, however, the other side of the coin. Indeed, when approaching the issue of security in Smart Cities, one must also consider the security risks that this urban model generates, due to its intrinsic characteristics that are therefore both a strength and a potential vulnerability[157].

The most significant concern relates to the issue of privacy and how information is managed and kept safe from malicious and (mostly cyber) attacks. There is, therefore, an effort on the part of Smart Cities designers, decision-makers, those who guarantee its operation, and the authorities in charge of its security to provide "information security", that is, protection of information from attacks, fraud, viruses, and other criminal activities that would generate serious damage to individuals, infrastructures, and interconnected technologies. Besides, it is quite understandable that security becomes a pillar, an essential requirement for Smart Cities, because if it were not guaranteed, people would not trust and entrust their data to the countless devices and software that have become an integral part of their daily lives.

Therefore, if we want to ensure that a Smart City achieves its objectives, it is essential to secure users' information and the users' handling of the tools provided. In this way, it will also be possible to guarantee fair economic growth, as well as ensure the smooth running of the smart activities taking

[157] Relying too much on technology could entail numerous risks.

place in the city and the provision of essential services such as health, energy, governance, as well as the provision of the basic related services.

Another element widely used by Smart Cities is big data, from which this urban model can extrapolate the information needed to analyse and calculate urban situations in real-time and ensure a prompt response. However, there are also plenty of security risks and concerns, such as inadequate tools to manage big data, data leakage, or cyber-attacks to illegally steal information. Consequently, on the digital security front, there is always the need to be vigilant and to find innovative software that ensures privacy security.

3.3 Security methods in Smart Cities

On the back of the opinion that Smart Cities are composite entities, the wide variety of technology implemented to support the arena of urban security accomplishes multiple functions.

While some tools have not been created with the idea of directly performing a security purpose[158], some others might fulfil different aims[159]. Furthermore, when analysing the instruments that Smart Cities offer and rely on to guarantee citizens' and public spaces' safety, it is clear that some accomplish the traditional and "basic" security function, thus they detect, prevent, identify, authenticate, and defeat urban threats; others are used as complementary tools, thus able to improve and reinforce the traditional systems that perform urban security duties, to integrate more services and functions and enhance the smartness of the urban environment; then, there are also technological tools that, contrary to what happened in the past, facilitate collaboration and interconnection between different working sectors, allowing more immediate and easier communication and information exchange, as well as the possibility of collecting data and building predictive models to be able to truly implement the concept of urban and integrated security.

As the work "Security and the smart city: A systematic review[160]" laudably classified, there is a considerable number of studies that have focused on identifying which typical Smart City techniques (IT and technology) could support the security function in an urban context.

[158] It is possible to think about the software or the additional components of some tools such as CCTV, whose objective is to improve and make a certain technology more effective.
[159] It might be the case of a device with the direct purpose of raising an alarm and then activate dome defensive mechanisms.
[160] Laufs, J., Borrion, H., & Bradford, B. (2020). Security and the smart city: A systematic review. *Sustainable cities and society*, *55*, 102023.

Consistently with this dissertation, here are some security functions – performed by several strategies to contrast criminal risks – worth of mention.

Concerning the detect and prevent security objective, numerous are the interventions to detect anomalies, threats, unlawful and inappropriate behaviours, and to avoid their occurrence.

They are carried out according to different methods. In some circumstances, it is possible to consider individual or collective actions, analyse facial expressions and lip movements through surveillance cameras, Artificial Intelligence (AI), and facial expression tools. Nonetheless, these dangers can be acknowledged and prevented also through the study of big data and crowd movement patterns, therefore by GPS, location data, and fibre sensing networks.

Generally speaking, these actions rely on existing tools that cities – and Smart Cities – already possess. Nonetheless, the added value derived from the interconnection that Smart Cities provide is the possibility to immediately inform local enforcement authorities of fraudulent, illegal, and dangerous phenomena ongoing in certain urban areas.

Not only does this ensure immediate and targeted intervention by the police, but – thanks to additional IT systems and technological facilities – it can also enable the de-escalation of risky situations through "environmental" changes. In other words, the parameters of public lighting can be altered by increasing the brightness, unexpected sounds can be emitted, or communications can be transmitted by the police station via loudspeakers, or the microphones incorporated in cameras and ordinary instruments such as traffic lights. Moreover, once the dangerous situation has been identified and the number of people involved has been recognised, the task of identifying, tracking, and following the people or vehicles involved becomes much easier for the police to the extent that real-time chases or tracking become more immediate, allowing the threat to be contained and resolved within a short time.

Among the many examples of technologies and strategies to detect situations of insecurity, it is possible to think about the use of intelligent platforms that, thanks to IoT, facilitate and optimise day and night vision of security cameras, record and make sounds more audible, clarify images and zoom in to capture lips movements or identify facial expressions that imply an imminent manifestation of violent behaviour. To prevent crises and dangers in key and critical city infrastructures, sensing networks can be used to monitor various structural and environmental parameters, as well as indoor mapping technologies to provide security inside buildings (whether public or private). Then, also the resort to fibreoptic sensors for perimeter protection is a good measure that combines technological monitoring and security of certain areas. It is also important to

consider the importance of using sensors capable of detecting sounds and identifying their source, thus distinguishing between sounds from firearms, broken glass, car or flat alarms, and the appliance of intelligent video surveillance tools that recognise and predict abnormal situations based on movements and analysis of objects on public land, such as the recognition of dangerous objects (blunt, explosive, firearms). Similar to these technologies are sensors that capture the image of intruders in public and private buildings through IoT-based security systems. Moreover, there are also public "smart" video surveillance systems relying on networks of wirelessly connected sensors to rapidly share information to law enforcement authorities, smart devices for, not only but especially, women that detect harassments through GPS tracking, alarm, force sensors, and shock functions, not to mention the use of machine learning to monitor and detect fraudulent transactions and the innovative sound, smell, and lighting programming and modifying sensors used to remotely modify the environmental conditions in a specific place where a situation of danger is ongoing.

Given that these tools have already been studied for their applications in the field of urban security, it should be recalled that the innovative element that the Smart Cities introduced concerns containment and automatic intervention in situations of insecurity. The term "automatic intervention" refers to the marginal role that the human being – in this case, the security officer – plays in these circumstances: for example, the presence of cameras with sensors that detect and distinguish a wide variety of sounds allows, in the event of a burglary in a house, to activate a risk notification system, so the computer system to which the surveillance camera is connected recognises a danger associated with the sound of broken glass, or tampering with a door, and transmits a warning to a wider software to which the local police or other private security forces are connected, allowing prompt intervention at the scene. In this circumstance, most of the work is carried out by computers, whereas it is in the actuation response that there is an active role played by security forces.

Naturally, for this type of security intervention to be as extensive and precise as possible on the urban ground, it is necessary to equip the city with a network of multiple intelligent devices, thus intervening in the urban planning, requiring modernisation, investment, and regulatory changes. The latter is a very delicate aspect, a window onto a multidisciplinary discussion in which technology, privacy, security, ethics, and risks are mixed, as will be seen in section 3.5.

There are then interventions with the precise intention to authenticate, and then defeat, situations of urban insecurities. The use of GPS, speed, and location data to identify the place where an unlawful action was carried out and to ensure prompt action, or to follow internet access data, Wi-Fi networks, or Bluetooth connections to which mobile devices (or cars) have logged on and connected, to establish who was present on the scene, are just some examples. To these ones it is

possible to add the role played by facial recognition software and the use of surveillance cameras to identify suspects and those who entered without authorization in some city spaces, as well as the use of GPS data from the vehicle or data from the smartphone of someone who accessed a restricted zone.

These measures for the identification of unauthorised access to specific places or transit through places where a crime has been committed are then completed and made effective thanks to the intervention of the security forces which take care of establishing barriers, often physical, that block or limit the movements of those who have been recognised as perpetrators of illegal behaviour, or who simply find themselves facilitated in the investigations because they know which individuals are allegedly involved. We are therefore talking about police interrogations or fines, restraining orders or bans on access which, however, in a Smart City can also be established in an "automatic" manner, as is the case for fines resulting from access to restricted traffic areas without authorisation.

Once again, it emerges that the smartness of these urban models lies in facilitating and streamlining the procedures that security officers have to carry out, very often also minimising the errors that are made by the human eye due to oversight or confusion. It must also be said that the use of technologies that recognise the absence of transit permissions and smart access control measures can also be understood as an incentive for sustainable mobility[161].

With greater reference to facial recognition systems, pros and cons emerge. In some states, police officers wear nano-cameras whose technology and connection to databases allow facial recognition of those who approach the officer. This allows the identity of those interacting with the police to be known without requiring ID and, in cases of suspects, it is easier to create matches between the face recognised by a security camera at the scene of a crime and the face captured by the camera embedded in the policeman's uniform. If a reliable match were to emerge, it would immediately trigger the public officer's authorisation to detain the suspect, without having to wait for a "manual" confrontation that might take longer. However, negative aspects also emerge. Knowing that as soon as one approaches the public security officer is identified, the risk could be to avoid contact. Moreover, a wide rhetoric opens up about privacy and protection of one's data and image.

Within the Smart Cities framework, there are intelligent means of ensuring urban security that coincide with the improvement and automation of existing systems and tools, which only need to be updated to keep pace with the technological, interconnection, and multifunctionality requirements of the Smart Cities. Therefore, solid investments are needed to ensure the improvement of these tools

[161] In this respect, it is possible to consult Barba, C. T., Mateos, M. A., Soto, P. R., Mezher, A. M., & Igartua, M. A. (2012). Smart city for VANETs using warning messages, traffic statistics and intelligent traffic lights. Paper presented at the 2012 IEEE Intelligent Vehicles Symposium.

that are already used in urban security, but public money invested in modernisation operations also implies a reduction in the costs of buying new tools, especially since these are not always necessary.

In addition, improving the technological functionality of "old" devices means pursuing a form of sustainable innovation, in line with the principle of zero waste.
Existing equipment needs to be innovated and upgraded as its functionalities could not support the processing of a high data flow. Thus, maintenance or upgrades of software and hard disk can be carried out to avoid a complete replacement of the device.
We need to focus on scalability, to make data collection, transmission, and analysis faster, safer, more accurate and cheaper, and in doing this, AI is significantly helpful.

It is also necessary to emphasise how appropriate it is, and not at all implicit, to modernise the infrastructures already in place and in use, because Smart Cities are not built from scratch, but are urban models that are developed in already established urban realities, making progressive and transversal changes. Therefore, even more so in a globalised world with very high rates of urbanisation, the aim must be to create a network of innovative technologies that can increase urban security functions from the basis already available in the city.

Hence, considering that the improvement of urban services starts with existing devices and the intention to make them more efficient and manageable in the future, here are some examples of upgrades.

To avoid faults of static CCTV systems, a strategy is to create cloud databased to implement live video streaming of surveillance systems and to use algorithms to reduce the amount of memory necessary for the wireless sensors, as well as to use IoT-based surveillance tools that rely on computers to process data, and to convert video in 3D through specific graphics. Then, it is worth creating a parallel architecture for smart video surveillance and adding the function of video summarisation, so that the amounts of data recorded and then analysed can be minimised. Then, to improve the re-identification of suspects from CCTV tapes, it would be successful to implement multiple deep metric methodologies that, through the recognition of person similarities can compare different footage and identify the person of interest. This is related to the usefulness of analysing all the video data extracts that are collected from camera networks, and it would be useful to distribute in real-time the footages of wireless surveillance systems, to immediately authenticate and track in some events.

A further element that can be recognized as compelling for the safeness of a Smart City is the connection between different tools. In other words, the various security solutions present in the urban

environment should be integrated. Thus, a precise architecture – physical but even digital – should be used to connect sensors and actuators devices to make security provision more efficient. Practically speaking, AI could be used to manage large-scale video footages, individual and vehicle identification or re-identification, and facial recognition, as well as new integrated platforms to correlate mobile radio systems, wireless sensors, social networks, and data-related software could be useful. Then, to invest in mechanisms that enable interactive video surveillance with the possibility to define certain priorities to be monitored, without losing the focus on the non-priority events, is another virtuous instrument that Smart Cities offer to urban security. Furthermore, to ameliorate the CCTV placement, not only algorithms should be involved but also a computational methodology that reorients and merges the visions of more cameras in a certain area under specific surveillance. Online systems for police stations should be incremented, so that the ordinary work can be digitalised and with cameras or sensors that recognise a security threat and capture the live location of an emergency, an immediate alarm could be given to police forces. Another praiseworthy integration refers to the management of public information over security, namely, thanks to the numerous data flow, it is important to deploy them to the interested population in the right way, and also relying on technologies.

On the information front, technologies applied in the field of urban security can improve it in a variety of ways, as crowd sourcing and mass information platforms bring public bodies and citizens closer together, developing forms of e-participation and inclusiveness. Examples include the use of personal mobile devices and social networks that provide users with real-time information on security levels in different urban areas, or the technological devices carried or worn by individuals who can contact the police through an app to request immediate intervention or report a suspicious event.

Associating technology with urban security today is a must, not an alternative. This is because a large part of our life and sociality takes place online, through screens and virtual interactions, so it is necessary that social monitoring becomes a new dimension of urban surveillance.

Thinking in such terms means considering, mostly, smartphones, thus creating apps and software specifically designed for them so that technology is seen as the bridge to connect individuals and law enforcement. Giving more attention to smartphones rather than to tools such as tablets or computers is a direct consequence of the fact that mobile devices pervade our daily lives, are used by everyone with regularity, for various purposes, and facilitate the collection and dissemination of mass information.

Nonetheless, a downside is given by the fact that user-centric applications are open to misuse[162] and malicious subjects might report false crimes or mislead police forces that are monitoring civilians' warnings. Therefore, constant and precise fact-checking is imperative, as it even increases the level of police intervention's credibility.

Finally, given the increased attention and approval that predictive policing has gained over time, it is worth considering how the technological infrastructures of Smart Cities fulfil such functions.

Through data gathering, analysis software, and the integration of public and private information systems – mainly from law enforcement authorities – it is possible to gain knowledge of historical crime data, identify crime patterns, and predict unlawful behaviours. To recognise the architecture and the demographic feature of the urban spaces means to detect high-risk crime regions, often in a more accurate way thanks to the security data that the individual inhabitants of certain areas provide. Then, going into technicalities, the use of digital decision support systems which advise on the best intervention accordingly to the probability that a given phenomenon will occur, is another way in which Smart Cities facilitate security in the town.

3.4 Security benefits deriving from Smart Cities

As already pointed out, the goal of a Smart City is to ensure a more profitable and sustainable use of (public) resources, improving the services offered to citizens, and reducing the costs faced by public administration. A good way to achieve this goal is through urban IoT, thus providing the urban environment with interconnected infrastructures that facilitate access to public services and increase transparency. Indeed, dealing with cutting-edge but heterogeneous and unconnected technologies means, in this case for a city, embarking on the road to evolution without the right means to do so. The power of the Smart City model, on the other hand, is that of fully realising the potential of the infrastructures used through their interconnection.

This urban IoT ensures the optimisation of key functions carried out by public authorities, facilitates the operations of private individuals, increases the sense of urban security by ensuring more controls and immediate intervention, and has a social impact through better services offered to hospitals, schools, and cultural institutions.

[162] Yang, K., Zhang, K., Ren, J., & Shen, X. (2015). Security and privacy in mobile crowdsourcing networks: challenges and opportunities. IEEE communications magazine, 53(8), 75-81.

In addition, the use of IoT in the urban arena is a way of bringing citizens closer to governance, keeping them informed of the real state of the city, involving them in the management of public affairs by making it open and transparent, and creating ad hoc services. All of this is made possible by the fact that the technologies used facilitate the management of increasingly large numbers of data which, if properly collected, analysed, managed, secured and, where possible, disseminated, become the city's strengths.

Accordingly, it is possible to understand why the Smart City urban model is attractive not only to citizens but especially to public administrations (local but also regional), which, by adopting this scheme and the technologies deriving from it and necessary for it, could become an example of administrations implementing good and best practices to be then expanded to wider levels. Only with these intelligent cities is it possible to bring together new and already existing technologies, infrastructures for communication, computing, and data dissemination, and the collection, securing and sharing of information that benefit public entities, private bodies, and citizens.

In this context, the digital age has acted as a catalyst for progress, giving rise to opportunities that are transforming our lives, combining IoT with operational and information technology.

To have an example of those sectors where the greatest benefits generated by Smart Cities are evident, always considering the parameter of comprehensive security, we can identify:

(i) City monitoring, public safety, and emergency responses: first and foremost, the law requires that local authorities monitor behaviour and activities on urban land to ensure urban safety. However, this urban control is not only about illegal activities, but also about the different functions and services that are daily performed in a city, such as the provision of energy, water, food, and information. The way in which Smart Cities technology can intervene to facilitate this city monitoring activity has to do with pervasive and ubiquitous computing techniques that extract key information from various devices and process it to facilitate active control and ensure security.

ICT-related safety measures for cities are another tool to enhance the provision of public safety – here intended in a more specific way as the protection of citizens, organisations, and institutions from possible dangers – and of environmental and health security standards.

Additionally, to dispose of continuous monitoring activities of the urban environment is an incentive to execute specific emergency responses. Indeed, if the law enforcement bodies' objective is to reduce the harmful effects of all hazards – natural and men-induced

– emergency services must be ready to deal with all possible scenarios, thus being at the cutting edge, and the IoT can play a very beneficial role.

(ii) E-government and transparency: when in a country, a region, or a city public services are provided to citizens through the use of electronic communication devices, computers, and the IoT the government can be called e-government, namely electronic government, which is the one present in a Smart City. Further development of the concept and the practices that the e-government entail is the appearance of smart governance, so a model that permits citizens and stakeholders to be involved and proactively orient the decision-making process, which ultimate target is to increase the quality of life of the urban dwellers.

E-government and smart governance give rise to transparency, which has positive security implications, as citizens have access to public documents and procedures, thus supervising the public activity and requiring high levels of accountability, a key element to ensure efficiency and reduce corruption. Nonetheless, as sensible big data are stored and processed, a safe government must also take care of the elaboration of new laws and policies of data privacy, availability, and management.

Furthermore, public officers' knowledge of ICTs shall be increased to enhance security and focusing on smart and sustainable growth[163].

(iii) Structural health of buildings and infrastructures: buildings, green areas, and public spaces provide well-being to the citizens and the environment. Thus, constant maintenance of historical buildings, motorways, bridges, railways, and ports enhanced by the nonstop monitoring of their conditions and the recognition of areas subject to the impact of external agents and the consequent implications provide widespread security.

The use of the urban IoT is a powerful means to perform several computations, as well as to create and maintain an up-to-date database capable of collecting data stored by special sensors installed in the most strategic places to recognise the health status of a given infrastructure or building[164]. The usefulness of the database is to provide continuous and immediate access to professionals involved in urban maintenance and decorum, who can

[163] Sánchez-Corcuera, R., Nuñez-Marcos, A., Sesma-Solance, J., Bilbao-Jayo, A., Mulero, R., Zulaika, U., ... & Almeida, A. (2019). Smart cities survey: Technologies, application domains and challenges for the cities of the future. *International Journal of Distributed Sensor Networks*, *15*(6), 1550147719853984, page 25.

[164] Sensors could even combine vibration and seismic readings to better understand the impacts of earthquakes on city buildings. Further information available at Zanella, A., Bui, N., Castellani, A., Vangelista, L., & Zorzi, M. (2014). Internet of things for smart cities. *IEEE Internet of Things journal*, *1*(1), 22-32.

inspect and manage public areas' "health" even remotely, not to mention the possibility to be alerted when, for example, according to a certain parameter, a building is risking collapsing, thus endangering people's lives.

Such a database could also offer useful insights into specific aspects of the urban territory. Indeed, a plethora of sensors and devices nearby water areas might help the urban decision-making apparatus over the determination of building new dams or preventing future damages by floods.

Furthermore, this database could be opened to the public and ensure awareness of the measures that public authorities take to protect the physical integrity of individuals and buildings, reinforcing public trust towards the local government.

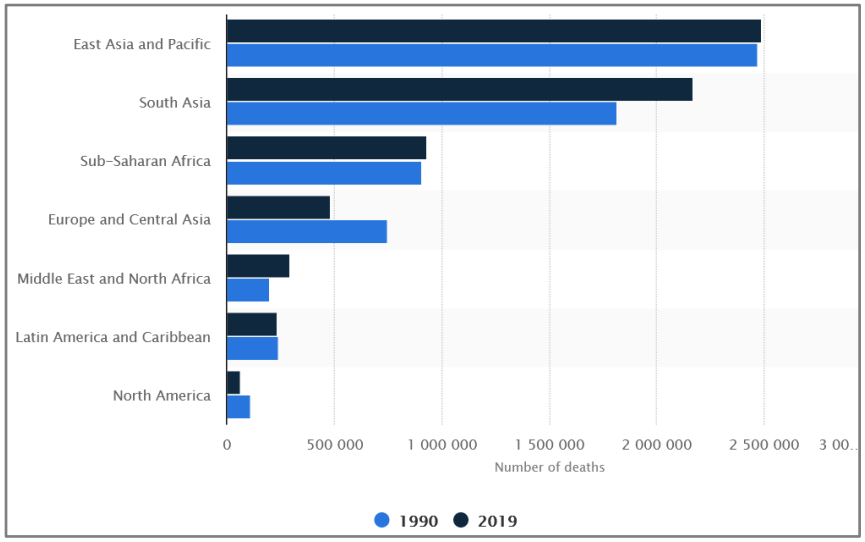
Another aspect to be considered when analysing the construction sector within a Smart City is the importance of making buildings self-sustainable (a goal also pursued by the Eco-City urban model). By investing in the interconnections between energy infrastructures, energy efficiency, indoor climate, and the building-grid interactions, the result is an architecture that facilitates the installation, use, and maintenance of panels or other structures that harness renewable energy to run the city and its buildings. By doing so, the city would not have to depend on fossil fuels imported from other countries, and geopolitical dynamics would not influence their cost or arrival. In addition, the general state of the urban environment and the well-being of citizens would increase exponentially.

(iv) Waste management: as cities are growing in size and population, the waste generated by citizens is following the same path. Therefore, waste management is another area of concern when it comes to city management, public health safety, and urban decorum. Indeed, cramming waste into landfill sites, buying the right equipment to ensure full recycling, and ensuring the ongoing provision of a basic service such as waste collection is a significant problem that modern cities have to deal with, as well as a significant cost. Furthermore, considering that the waste sector is central to issues such as urban decorum, the sanitarian level of quality of public spaces, and the amount of satisfaction that a community has with those who administer it, the use of technology in this domain would be an excellent choice, allowing the optimisation of the use of public money, as well as ecological and health benefits, resulting in an increased sense of security, both ecological and human in nature. Among the examples of technologies applied to waste collection and management, there is the use of smart bins that notify when they need to be emptied, detect

whether the wrong garbage has been inserted in the wrong container, and collect data related to the recycling attitude of the neighbourhood and send them to the municipality to track the environmental impact that the community has, as well as its consequences.

(v) Pollution control: when it comes to human health and safety, air quality is a fundamental parameter to observe and monitor[165]. In this activity, the use of technology is compelling, as it ensures the monitoring of pollutants in parks, fitness trails, crowded areas, or, if the network of devices is widespread, even in the entire city. Dealing with this parameter through technology would ensure precise and easily understandable monitoring, so that, if pollution levels were deemed too high and risky for the health of citizens, the mayor could issue extraordinary ordinances to limit the circulation of cars, or prohibit transit in certain areas, with the primary objective of safeguarding the health of individuals and not putting them at risk. As the graph below shows, according to a comparative study that analysed the air pollution-driven fatalities occurred in 1990 and 2019, the regions of East Asia and Pacific, and of South Asia are those suffering the most deaths, whereas in North America, Europe, Central Asia, Latin America, and the Caribbean the number of deceases has shrunk.

Figure 11. Global deaths from air pollution by region 1990-2019.



Source: IHME, & Health Effects Institute. (October 21, 2020). Number of deaths attributable to air pollution in 1990 and 2019, by region [Graph]. In Statista.

[165] Indeed, when breathing, pollutants get into our lungs, enter the bloodstream, and reach internal organs, causing severe health problems (asthma, cardiovascular diseases, cancer) that reduce the quality and number of years of life. Especially vulnerable categories such as children, people affected by chronic diseases, and the elderly are significatively endangered by the negative effects of toxic air. Furthermore, polluted air causes the acidification of our ecosystems, leading to the loss of agricultural productivity, irreversible damages to the soil, and the loss of biodiversity. Additional risks are those experienced by the cultural heritage, as these monuments or buildings can suffer from architectural degradation because of the toxins in the air.

The same sensors that detect humidity, CO2, and other pollutants would also be useful in identifying fires at an early stage, allowing firefighters to intervene quickly.

Another form of pollution imperative to be monitored in a city is the acoustic one. Noise pollution is as dangerous as air pollution, to the extent that national and local authorities established limits and regulations to reduce the amount of noise. The additional help offered by technology in a Smart City would be the possibility to constantly monitoring noise "broadcasters" and, if they emit levels of noise that exceed the standards, a sanction could be issued immediately. Additionally, as reported in the previous section, such a service could enforce public security through the recognition of the sounds deriving from glass crashers or brawls, thus offering an immediate police intervention. Having sensors that pick up different noises and algorithms that process them by recognising their source is a huge advantage that Smart Cities offer to their inhabitants and the police, as it makes the security authorities ready to intervene, and the citizens more reassured.

Another scope where technology appears useful is water management. Water is an essential natural resource and requires *ad hoc* methods of management and control, to guarantee sustainable use of it. Therefore, the use of sensors to capture water salinity, acidification, and heavy metal presence in aquifers would inform public authorities and private corporations involved in the water distribution sector whether the water we are using is salubrious.

Moreover, as new pollutants are appearing, Smart Cities are useful for bio-monitoring and assessing the risks related to them, thus identifying emerging contaminants and listing them, understanding their consequences on human and health security, and assessing where they are present (if in water or soil)[166].

(vi) Traffic: rely on IoT and ICTs is a good way to keep an eye on another aspect of everyday life in cities, namely traffic. Indeed, traffic issues, increasing numbers of vehicles, and the risk of terrorist attacks through trucks against the crowd or car bombs are common phenomena happening in a city. Although cameras are being deployed on the roads quite intensively, the real leap forward is the connection and communication of fixed infrastructure devices with mobile devices belonging to the people moving on the roads.

[166] Sánchez-Corcuera, R., Nuñez-Marcos, A., Sesma-Solance, J., Bilbao-Jayo, A., Mulero, R., Zulaika, U., ... & Almeida, A. (2019). Smart cities survey: Technologies, application domains and challenges for the cities of the future. *International Journal of Distributed Sensor Networks*, *15*(6), 1550147719853984, page 23.

Therefore, the interconnection of GPS, acoustic sensors, air quality sensors, and cameras makes it possible to collect a lot of information, combine it, and get an overview of where the most crowded places are, if there are emergency or dangerous situations and, consequently, regulate traffic and send officers where necessary, so as to ensure the safety of drivers and pedestrians.

(vii) City energy consumption: as the European and national directives concerning energy consumptions aim to improve energy efficiency, reduce consumptions, and increase the use of renewables[167], IoT would be a secure help in monitoring the energy consumption patterns and level of the whole city, identifying sources of extreme and expensive consumption, tracking down energetic frauds, and setting priorities or limits to optimize the use of energy among people, thus not harming the environment. Of course, to have devices that monitor this issue and offer information both to the public and to the competent public authorities, it is compulsory to have them integrated with the power grid of the city.

The new smart technology being used in the energy sector allows us to optimise the energy value chain, consisting of generation, transmission, distribution, and consumption, to make our homes and buildings more interconnected, efficient, clean, and sustainable. In doing so, the economic opportunities and the resulting well-being grow exponentially[168]. An example is the development and use of smart grids, which overcome the high maintenance costs and the scalability problems of old energy systems, while also avoiding energy losses due to wastages in distribution, and energy retention adversities.

(viii) Smart lighting: most of us consider lighting essential to feel safe, especially at night. However, more light does not necessarily mean better conditions. What is truly needed is a system of smart lighting, capable of illuminating the street, but without leading to light pollution. Therefore, the optimal solution would be to integrate a service of optimization of the street lamps within the Smart City infrastructure, thus modifying light intensity according to factors such as the presence of people, the time of the day, the weather condition, and considering these scenarios, another one could be added. Indeed, an

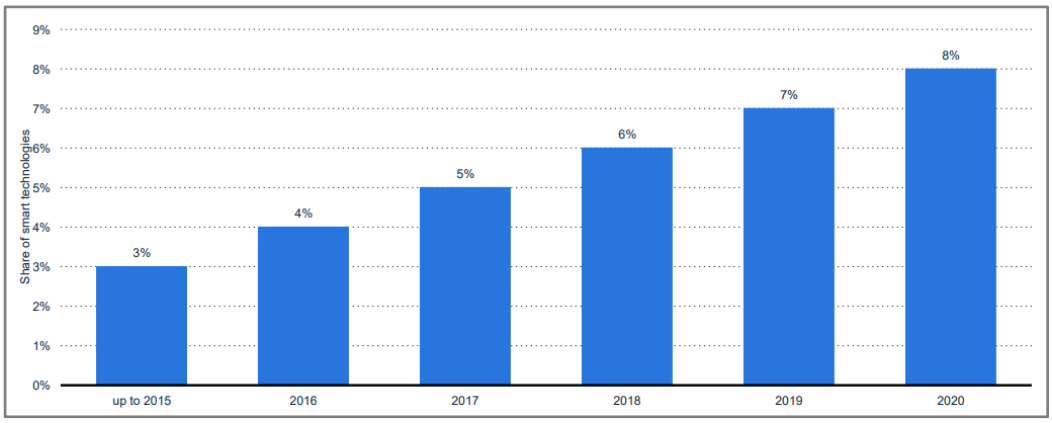
[167] An example is the 20-20-20 Renewable Energy Directive of the European Union, which called for a 20% reduction in GHGs emissions by 2020 (compared to 1990 levels), a 20% cut in energy consumption through improvements in energy efficiency, and a 20% increase in the use of renewable energy sources.

[168] For further information: Mylrea, M. (2017). Smart energy-internet-of-things opportunities require smart treatment of legal, privacy and cybersecurity challenges. *The Journal of World Energy Law & Business*, *10*(2), 147-158.

intelligent lighting system could act as a deterrent to micro and macro-crime activities, as sudden changes in lighting would intimidate criminals and make them think that they are being watched by the police authorities through the technology integrated into the smart city.

Regarding Italy, it has been computed the share of smart technologies implemented in the field of public lighting from 2015 to 2020. What emerges is constant growth, with smart technology appliances being, in 2020, 8% of the total equipment installed.

Figure 12. Share of smart technologies deployed in the Italian public lighting system in the period 2015-2020.



Source: Energy & Strategy Group. (September 30, 2016). Share of smart technologies deployed in the field of public lighting in Italy from 2015 to 2020 [Graph]. In Statista.

(ix) Education: in a city, the learning environment is not exclusively made of schools. In fact, learning opportunities come from families, communities, workplaces, and public spaces. If the city is able to deploy ICTs into education it opens new doors for education services, offering multiple channels of interactions with different realities, facilitating students' approach to online and offline study, and creating smart citizens, the true inhabitants of a smart city. Investing in education using the tools that a Smart City has to offer means to create educated, informed, skilled, and inclusive citizens, which behave in compliance with the law, thus reducing events of intolerance, violence, and crime.

Furthermore, Smart Cities have the potential to create new services and platforms to engage people in city life, but, considering that these tools are based on ICTs, all those grown-up citizens unaware of the multiple functionalities and challenges of the Internet must be educated. As a consequence, Smart Cities entail a re-thinking of education, that has to be connected with the evolution of technology and the proper security awareness over its challenges.

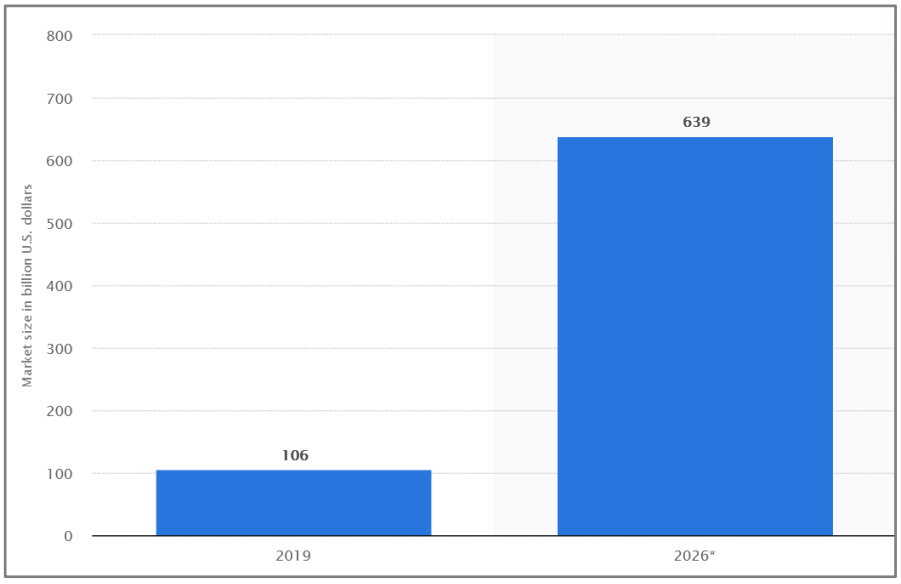
(x) Healthcare: with the expansion of technological devices, the term smart healthcare appeared. This concept has to do with sensors and devices connected to patients[169] that collect data on their state of health in order to identify, in presence and remotely, the best treatment protocols, to anticipate critical situations before they occur, or to call for help as soon as the risk of an illness becomes apparent. It is explicit the linkage with the health security that such devices provide.

Furthermore, they represent a viable solution to the problem of caring for the elderly and disabled people, as a network of sensors in the body of the patient and around the ambient capture their vital signs, behavioural patterns, and activities performed, to then analyse them and detect, prevent, and predict health-related events.

The smart healthcare sector appears to be promising and growing fast, as data from the US demonstrate. Over the last ten years investments in the digital health industry have peaked, starting from one billion US dollars in 2010 to over 21 billion US dollars in 2020, and these expenses were matched by patients who, before and during the Covid-19 outbreak, increasingly made use of digital health tools.

Given this basis, the forecasts for the years to come show an expectation of growing reliance on smart health, as the following graph demonstrates:

Figure 13. Global digital health market size in 2019 and a forecast for 2026.



Source: Global Market Insights. (June 15, 2020). Global digital health market size in 2019 and a forecast for 2026 (in billion U.S. dollars) [Graph]. In Statista.

[169] Such as bracelets and technologically advanced watches.

3.5 Security risks deriving from a Smart City

The transversal and security benefits and opportunities outlined in the previous section throughout a Smart City are achieved, however, at a cost.

The widespread and pervasive implementation of technology to ensure a city's smart credentials leads policymakers, citizens, and law enforcement agencies to raise numerous questions ranging from ethics to cybersecurity, and this is further supported by the knowledge that while the ICTs constitute the backbone of a Smart City and offer useful tools to facilitate the urban activities, they also trigger new concerns related to security, privacy, protection, and resilience.

Everything that has to do with privacy and the data that is collected is becoming more important and requires regulatory evolution to ensure its use and respect, otherwise, privacy and cybersecurity will become obstacles and barriers to the realisation of economic, environmental, social, and security gains.

Hence, it is necessary to reflect on the downsides that Smart Cities entail because in the long term these could erode the very structure on which this urban model rests and could lead to new urban security risks that are even more serious than those that smart technologies seek to mitigate and tackle.

Moreover, when analysing the advantages and disadvantages of Smart Cities, there are many conflicting opinions coming from the academic world, as is the case with all far-reaching, complex, and innovative topics that imply a profound transformation of individuals' lifestyles.
Indeed, while some believe that "surveillance technologies are a key component of smart and networked cities preventing or detecting crime and giving the residents a sense of safety[170]", others argue that the sense of security might be jeopardised by the continuous presence of a "Big Brother" watching, detecting, and analysing every single move that a person makes[171].

Analysing in detail the problems related to security in Smart Cities, a first reference must be made to the technical aspects, namely the features and functionality of the devices that make up the infrastructure of the urban IoT, which can be considered vulnerable if the interconnectivity among the different instruments is not guaranteed. If it were the case, the urban smart system would not be properly secured simultaneously, and thus it would be exposed to possible negative cascade events.

[170] Van Heek, J., Aming, K., & Ziefle, M. (2016). "How fear of crime affects needs for privacy & safety": Acceptance of surveillance technologies in smart cities. Paper presented at the Smart Cities and Green ICT Systems (SMARTGREENS).
[171] Laufs, J., Borrion, H., & Bradford, B. (2020). Security and the smart city: A systematic review. *Sustainable cities and society*, *55*, 102023, page 39.

Indeed, smart tools suffer from hardware limits[172], software restrictions, and hard-network requirements[173].

It is important to reflect on these aspects, because neglecting them would impede the creation of practical security mechanisms to be implemented directly in devices, such as cryptography. Nonetheless, many designers overlook the issue of "security" at the product creation stage, hoping that it will be implemented at a later point in time, without realising that such a decision makes the costs outnumber the benefits.

Keeping the focus on technology, as it is the main pillar on which Smart Cities are expected to grant smarter and more sustainable economic growth, smarter governance, and smarter services[174], the credibility of all these opportunities is questioned when concerns dealing with privacy, data, and physical security emerge.

Reviewing the core technologies from the perspective of security, concerning the heterogeneous IoT's family of devices, radio frequency identification tags (RFID) are, for example, those predominantly used in the smart domains of environment, industry, and mobility. They ensured real-time visibility and traceability, although they are not incontrovertible fortresses in terms of security. Indeed, they risk disclosing sensitive data through unauthorized access, thus generating problems of confidentiality and privacy.

The difficulty in implementing physical security components is due to the small size of RFDIs and, as far as unauthorised use is concerned, this has to do with the way communication between the user and the reader takes place, that is, with a single electronic product code that could be sabotaged by hackers. In addition, anyone who decides to attack this technology can resort to the technique of "tag killing", namely deleting the basic settings or physically destroying the device, so as to make it impossible to read or identify it.
Then there is "tag cloning", namely the collection of data from a tag and their copying – illicitly – onto a new tag, and the more standard "signal interference", since each tag links to two frequencies, low-frequency signal and high-frequency signal, and aims at altering the correct functioning of the device and the communication with those responsible for reading the collected data.

[172] Computational, energetic, and memory constraint.
[173] Mobility and scalability.
[174] Ijaz, S., Shah, M. A., Khan, A., & Ahmed, M. (2016). Smart cities: A survey on security concerns. *International Journal of Advanced Computer Science and Applications*, *7*(2), 612-625, page 616.

In the wake of attacks to disrupt the communication function, there is also jamming, i.e., disturbance of the air interface, and intervention in wireless signals, since it is on this basis that the communication of RFDI systems takes place.
The hacker could then interfere with the data collected by the reader in different ways, such as taking control of the RFID reader device and destroying the information through electromagnetic waves or extorting information such as the location without any form of authorisation, disabling the entire system making it useless through the so-called denial of service attacks or, in a more generic way, resorting to the well-known software attacks with viruses and buffer overflows.
When RFIDs are used in the smart mobility field, a malicious attack could even cause (intentionally) wrong traffic reports in satellite navigation systems to direct individuals to a specific location for purposes of, for example, terrorism.

In these scenarios, what becomes crucial is to use encryption and authentication strategies, as biometrics could be. Indeed, the automated recognition of an individual through behavioural and biological features – deemed unique – is a means to contrast frauds and malicious attacks in most of the Smart City-related domains, be they health, institutions, education, utility, borders, and urban control. Moreover, as in a Smart City it is imperative to have an optimal security performance of RFIDs, this could be achieved by data coding, data integrity checks, and with "tag sleeping", so putting the device on standby when there is no need to read it.

Since the term "encryption" will be recurrent in the pages to come, as it is an optimal strategy to guarantee privacy and security, it is convenient to open a parenthesis to deepen the meaning of this concept and to explain the bonds that it has with security.

Encryption is the process of "confusing" data so that only an allowed party can, through a key, understand the information. More specifically, it is about converting human-readable text or numbers to incomprehensive content, as the example below shows:

Figure 14. How encryption works.

Source: https://www.cloudflare.com/it-it/learning/ssl/what-is-encryption/ .

To reconvert the ciphertext into plaintext, as said before, a cryptographic key is necessary, namely a sequence of mathematical values decided by the sender and the recipient of the encrypted message (symmetric encryption), or one key used for encryption and another one used for decryption (this is

the asymmetric encryption procedure, where the decryption key is kept private and takes the name of "private key", and the encryption key is shared publicly, being called "public key").
Of course, the most secure encryption relies on complex keys to the extent that third parties are not able to guess them. When an attacker not aware of the decryption key tries to find it through millions or billions of guessing, it is a brute force attack, which harms the security of data. These attacks are faster when performed by modern computers, and this is the reason why encryption – and more broadly speaking passwords – must be solid and complex.

Encryption practices are a fundamental component of the security strategy created and applied in the Smart City model. Indeed, encryption ensures privacy by impeding to third parties, namely, governments, internet service providers, networks, and hackers, to read messages or sensitive data. By doing this, it prevents data breaches, because if a device, for example a smartphone, is stolen or lost and its hard drive is accurately encrypted, data will not be vulnerable. Another positive aspect of encryption is that it avoids malicious on-path attacks. In other words, when information is transmitted throughout the Internet, it makes sure that the final product obtained by the recipient has not been manipulated on the way.

Another key infrastructure in Smart Cities is smart grids, which can be defined as communicating tools and sensors that create a network to facilitate the exchange of real-time data in the field of, generally speaking, energy and resources.

The security angle occurs when it becomes clear that when data are exchanged in real-time between power generators, distributed resources, service providers, and users, information itself is at risk. A hacker attack that steals delicate information material related to the functioning of vast and crucial infrastructures means putting the entire system at risk of failure. Therefore, the imperative measure is to ensure data integrity, use sophisticated encryption standards, have public key infrastructures, and not to use the internet, rather TCP/IP[175].

There is also another device susceptible to very dangerous attacks on the privacy and habits of users, namely smartphones, which have hegemonized the field of smart communication and are the most effective and easy means to make citizens of Smart Cities truly participate in the network of services that are made specifically for them. However, their popularity and ease of use has made them

[175] The name TCP/IP is made up of the two protocols that are crucial for communication on the Internet: the Transmission Control Protocol (TCP) and the Internet Protocol (IP), although other protocols are also referred to by this term. TCP/IP is not a specific technology, but a cluster of protocols that have become the standard for communication in networks. The TCP/IP model has a great advantage because it works independently of the hardware and software, the operating system used, and the device used for network communication. Therefore, the protocols are standardized and work in any context.

a target for hackers, to the point of implying security threats that should not be underestimated. To give a few examples, malicious smart applications can be uploaded in the app marketplaces so that, once downloaded, can infect the phone and steal data, whose integrity is also at risk in social networks, depending on how they are used and how privacy settings are configured.

Hackers can also contaminate multiple phones with malware embedded and spread via email attachments, social networks, and websites[176]. Spyware can be used to illegitimately take over the functionality of a smartphone and locate, record, and monitor GPS location, calls, emails, and messages. In addition, the very use of WiFi lines poses risks to smartphone users, depending on the level of encryption used by the network to protect data.

It is also worth considering how risky all the tracking and data collection that takes place daily from the basic functionalities of our smartphones can be. Just to give a very few examples, apart from GPS, one can also think of personal images, gesture sensors, light sensors, barometer, accelerometer, and others, which, thanks to their characteristics, collect information on the number of steps, location, movements, and in some cases even private conversations and background noises, as well as medical bracelets or fitness watches, with the respective smartphone applications, that make full use of biometric and medical data that can even reveal the user's psychological state.

To avoid these dangers, anti-viruses and firewalls for smartphones are always recommended. The former category scans every data[177] and promptly intervenes against different forms of malware, while the latter is about blocking unauthorised connections to avoid network attacks. Then, authentication processes, as well as cryptography tools, and filters support the right functionalities of the smart device, ensure only its authorised use, and block contents from unknown origins.

As previously mentioned, the main cross-cutting issue around which a real dialogue in terms of security develops is the way in which data are collected, processed, and disseminated. Moreover, talking about data means dealing with the privacy of users, since most data are classifiable as sensitive and often risk being collected without the customer's explicit consent.

The real problem is that the larger the amount of data that is used, the more difficult it is to ensure the protection of privacy and security.

Acknowledging that individual privacy is a fundamental right, it should be guaranteed, especially in a Smart City. Therefore, smart strategies are needed to limit and eliminate the damage of improper data management, even if their identity is not immediate and often takes a secondary role to the

[176] This technique is called botnets.
[177] Files, memory, SMS, MMS, e-mails.

economic, environmental, and personal gains that come from interoperability, big data, social networks, and pervasive information.

In a smart space, every object and every technology has a specific role to play, and together they create an ecosystem that constantly and precisely controls and monitors individual actions and habits, as well as the surrounding environment. Discussing the smart space means considering, one by one, fields such as smart health and the digitalisation that takes place in the hospitals and the management of certain pathologies or health conditions, smart buildings, and how home security is combined with home automation, smart cars, and all the comforts they offer to the driver[178], especially in terms of safety with assisted and automatic driving and braking, and smart streets, with adequate lighting that can be modulated according to circumstances, cameras and sensors, and with the police always ready to patrol or intervene if necessary. It is also about smart communication, given that telecommunication is a critical infrastructure vulnerable to many mischievous attacks, viruses, frauds, and privacy violations. Therefore, the need for security and authentication grows. Then, another sector that in an intelligent city composes the smart environment is that of banks, finance, and business, as they are involved in the smart and sustainable economy that promises growth. In their regard, the security objective is to deter malicious attacks that could sabotage the economy of an individual, a private entity, or the city itself.

As it is possible to understand from the sectors listed here, the smart space encompasses some of the so-called critical infrastructures of the urban fabric, i.e., sectors that are essential for the proper functioning of a city and sectors from which big data are collected. If these data end up in the wrong hands, they might cause immeasurable damage to the urban system. Therefore, data integrity, resilience, and secure encryption systems are essential.

The security drawbacks to the smart space have to do with the need to provide and update private information so that many of the smart services provided are tailored to our individuality, personality, and needs. If on the one hand, this results in applications that suit us the most, on the other hand, there is a perpetual and massive tracking of our personally identifiable information, as well as those related to households and, more generally, to the inhabitants of a given place. This tracking then allows, through data aggregation, to profile citizens, better intended as consumers of a variety of services that are constantly updated and improved thanks to the latest information gathered. This creates a vicious circle whereby users are studied, new products are created, or existing services are updated to suit the

[178] As well as downsides, such as the possibility to associate speed, flow, and travel times with the driver's identity, and the tracking of sensitive locations.

user's tastes, preferences, and needs, and individuals are induced to buy or use more and more smart devices, becoming almost addicted to them.

It is also necessary to consider how essential public services are provided and what the security vulnerabilities are in the Smart City framework. Thinking about the usability of water, energy, and proper waste disposal, in a Smart City it is the IoT that guarantees its proper functioning, as it is necessary to involve utility companies (for the use of gas, electricity, lighting, and water), governmental bodies, and public administrations (to set standards, allocate resources, get feedback, and overview the processes of service implementation).

However, problems arise due to insecure websites interface, lack of adequate authorisation and identification passages, ineffective network services, insufficient mobile interface, and the gathering of additional data.

Interventions to secure these aspects are crucial, even because, as already mentioned, in a regime of far-reaching and substantial interconnectivity, the failure of one of the links of the chain decrees its collapse, or, at least, the paralysis of the system and the danger of its failure, and, as if that were not enough, among the many dangers of technology associated with the use of essential services, there is one risk that should not be underestimated.

This risk is often an implicit consequence of the collection of user consumption data that is then disclosed to utility providers and third parties who use it for time-of-use billing, forecasting, tariff, and energy efficiency advice. When this happens, considering that the user base is extremely large, the peril is that this conspicuous set of information is often elaborated and turned into intelligent insights that can be sold to the highest bidder or that become attractive to hackers and (non-legitimate) third parties who seek profit from their appropriation and sale on the dark web, even because we must keep in mind that in the online – and offline – world consumes' data are the fuel for free and paid services.

Additionally, with the extensive use of smart grids that use bidirectional communication with the users to efficiently manage the energy distribution, new privacy concerns emerge. Just to name a few, identity theft, real-time unauthorised surveillance, targeted home invasion, censorship, unwanted publicity, behaviour tracking, and public aggregated searches revealing individual attitudes.
The "list" of open challenges will, unavoidably, grow as smart technologies will connect with more sensors and appliances.

Every smart space then has to do with the broader practice of governance, to the extent that governance factors have security implications. Among the governance factors that trigger and

influence security, there are the utility, health, infrastructure, education, transport sectors, and many others. The most important thing for decision-makers and local authorities is to guarantee security for the key infrastructures and to require and perform specific security testing. Placing attention on this need for security testing is not at all self-evident, quite the contrary.
Indeed, the problem is that in the majority of cases government authorities are the customers of technology companies that provide smart strategies to manage the different sectors of the city. However, the problem is that these "special customers" do not bother to test the actual security of the products they buy, as they are more interested in testing the functionality of these technologies. To overcome this problem, an optimal strategy is to increase awareness among the authorities, informing them of the need for and importance of taking care of security, and, eventually, to oblige them to security test products through law dispositions.

Another aspect to study is how citizens use e-governance instruments and, oftentimes, make a lot of mistakes thus jeopardising the security of the e-government itself. It is indeed true that smart citizens are persuaded to participate, report, and plan alongside public bodies, but given that *herrare umanum est*, they might leave some devices unsupervised, not precisely and safely configured, without authentication settings, terms and conditions truly understood, and with inadequate passwords. Moreover, citizens might not be aware of the importance of separating and managing in different manners the data stored and transmitted, and they could fall victim to hacker attacks because they are not equipped with the appropriate security systems to prevent them.

In these circumstances, the public authority itself, possibly through dedicated offices for communication with the public, should inform citizens about how data is collected, held, processed, and disclosed because very often citizens find themselves not aware of exactly what data is taken and processed.

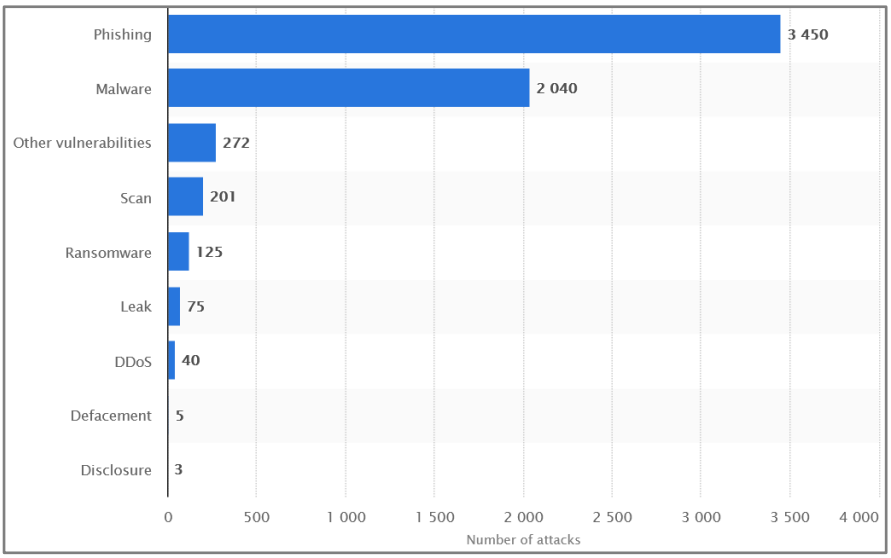
3.6 Conclusive remarks on Smart Cities and security, with a focus on the Italian case

So far it has emerged that the relationship between Smart Cities and security, albeit it can be declined in various domains, has to do, in most cases, with cyber-attacks of various kinds that exploit the numerous interconnected cyber-physical things, spaces, infrastructures, and users to cause damage, very often also systemic.

The examples of attacks are numerous, ranging from assaults on personal computers, food distribution networks, hospitals, electric heating systems, traffic lights networks, utilities, industrial infrastructures, and so on.

Taking into account the number of cyber-attacks, analysed by methodology, that were reported in Italy in 2019 to the Computer Emergency Response Team, as it can be seen from the data below, the most widespread type of cybercrime consisted in phishing attacks.

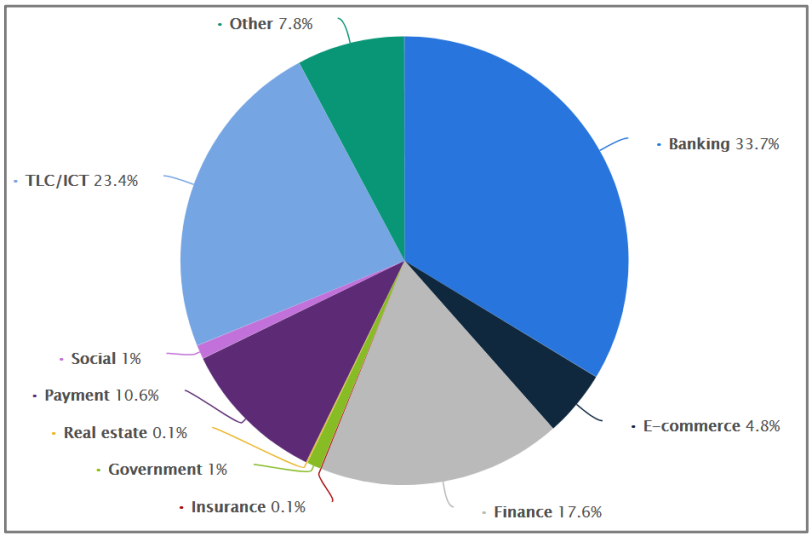
Figure 15. Number of cyberattacks in Italy,2019, by attack method.



Source: Associazione Italiana per la Sicurezza Informatica. (March 5, 2020). Number of cyberattacks reported to the Italian CERT (Computer Emergency Response Team) in 2019, by attack method [Graph]. In Statista.

By sector, here it is available a more specific distribution of phishing attacks:

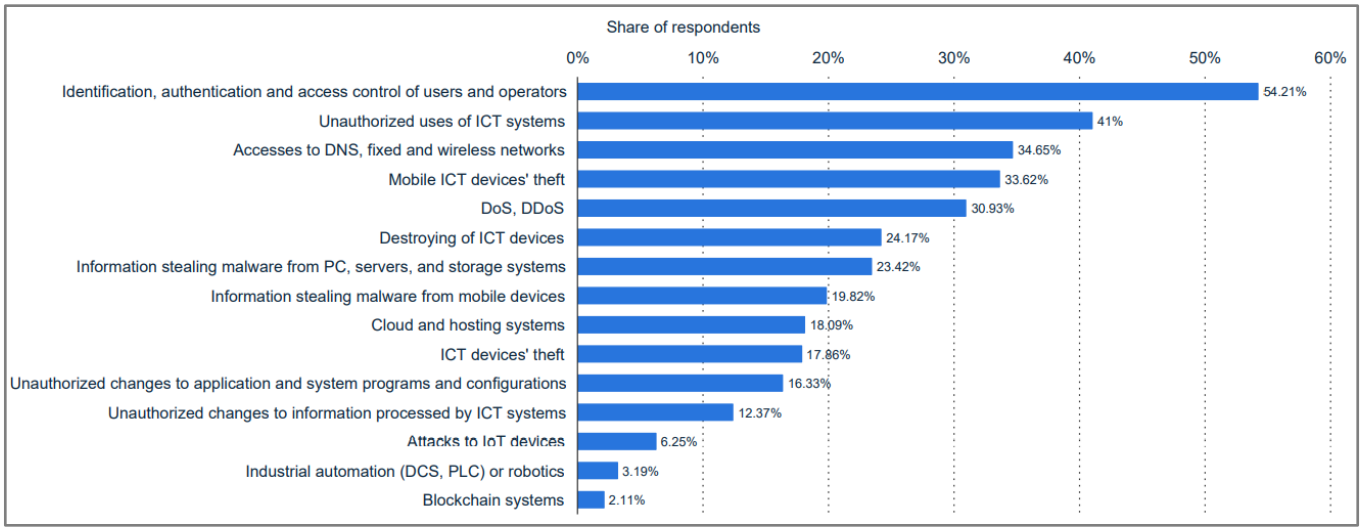
Figure 16. Share of phishing attacks by sector in Italy, 2019.



Source: Università degli Studi di Roma "La Sapienza". (March 5, 2020). Distribution of phishing attacks in Italy in 2019, by affected sector [Graph]. In Statista.

According to data collected in the year 2018, considering the cyberattacks that endangered Italian companies, major vulnerabilities emerge from identification, authentication, and access control.

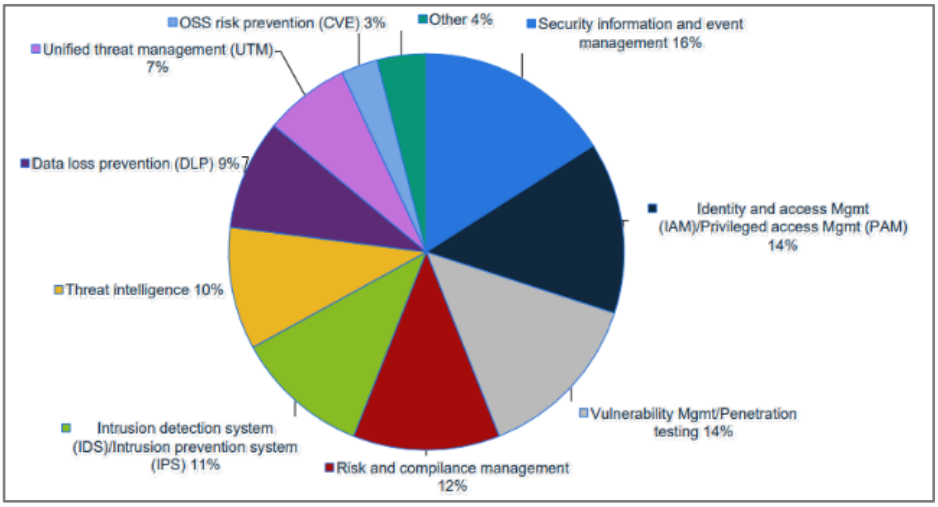
Figure 17. Types of cyberattacks in Italy, 2018.



Source: Osservatorio Attacchi Digitali. (February 18, 2020). Main types of cyberattacks in Italy in 2018 [Graph]. In Statista.

Several have been the studies and surveys to understand which security measures have been put in place by big private enterprises to guarantee cybersecurity. In the year 2020, here are the percentages of cybersecurity expenditures according to the different cyber sectors.

Figure 18. Breakdown of cybersecurity expenditure in Italy 2020, by solution type.

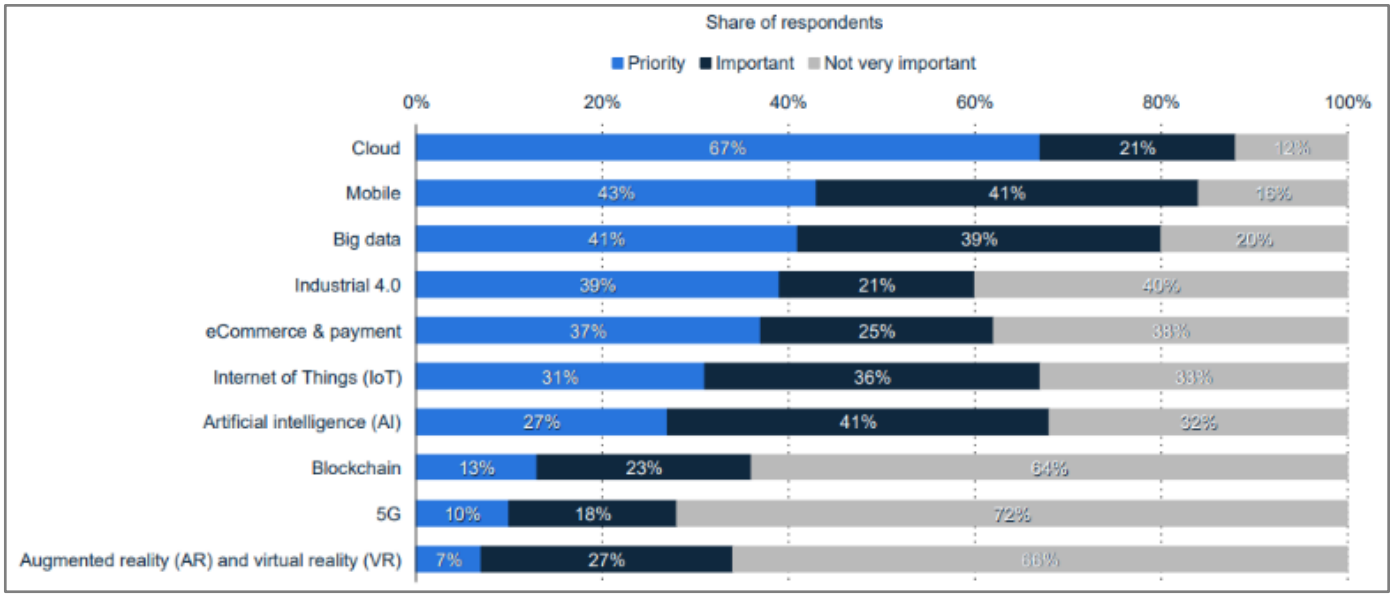


Source: Osservatori Digital Innovation. (February 3, 2021). Breakdown of cybersecurity expenditure in Italy in 2020, by solution type [Graph]. In Statista.

A more precise insight emerges from data, collected in 2019, regarding the investment priorities in data protection and cybersecurity.

The field that received major attention was the one of cloud computing, namely a technology that remotely, via the Internet, offers services such as server, storage resources, databases, software, and analysis. It is an increasingly popular "product" among companies because, with low management costs, it allows to dispose, immediately and everywhere, of useful information, improves productivity, and, above all, security, because through continuous backups it always allows data recovery, even after malfunctions or attacks.

Figure 19. Investment priorities in cybersecurity and data protection in Italy in 2019, by field.



Source: Osservatori Digital Innovation. (April 9, 2020). Investment priorities in cybersecurity and data protection in Italy in 2019, by field [Graph]. In Statista.

Nonetheless, the problem is that as much as both the public and private sectors can invest in smart strategies and IT equipment that provide security for the data they collect and process and the services they deliver, the cybersecurity problem would persist. Indeed, technology alone is not enough to guarantee security, it is necessary to have – on the other side of the computers – individuals aware of the risks and conscious of the preventive measures and precautions to be applied. Therefore, every euro invested in training employees and, more generally, citizens, is a well-spent euro.

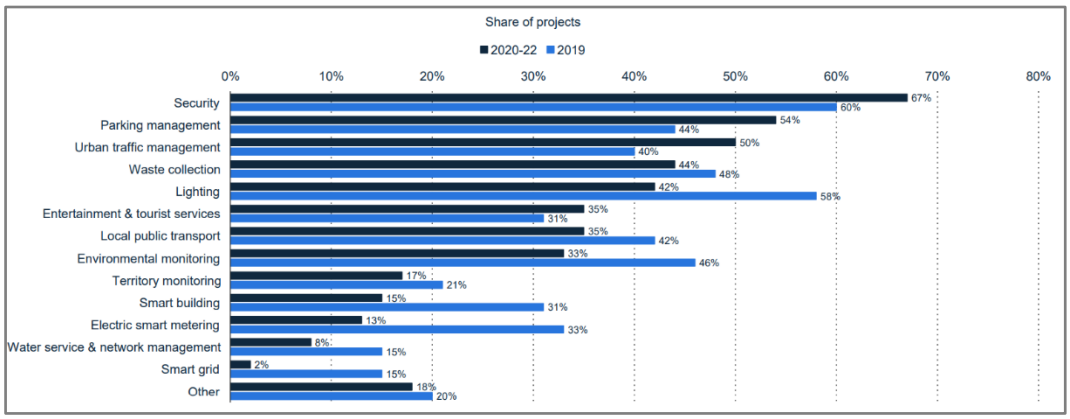
Then, there is another area in which public and private authorities should invest more and better to increase information security also intended as privacy: the blockchain.

It is based on a network capable of managing a large database while maintaining transparency of transactions, cryptographic security, and immutability. It can also be understood as a large non-

centralized archive that allows to safely manage data without the presence of a central authority and, for these characteristics, it is considered as the new generation of the Internet.

Zero in on the links between municipalities and smart security, the majority of projects elaborated for the period 2020-2022 aims to make cities more intelligent through a better realisation and implementation of security, and then continue to invest in other strategic areas for the full realization of the Smart City urban project.

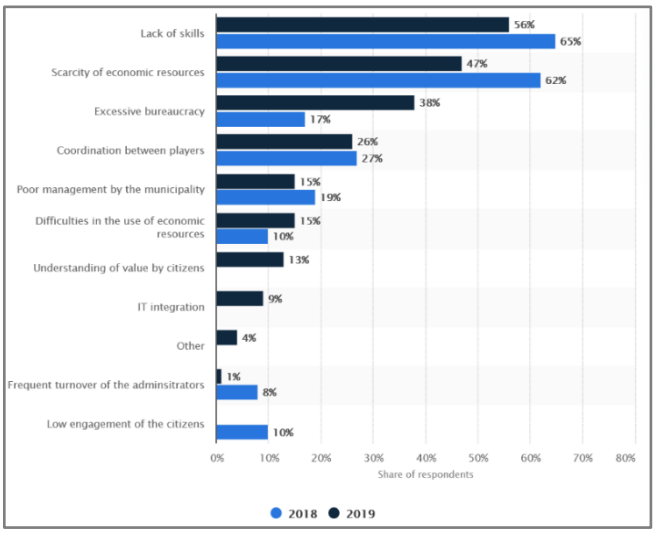
Figure 20. Municipalities' interest in projects for making cities smarter in Italy in 2019, by area.



Source: Osservatori Digital Innovation. (April 7, 2020). Municipalities' interest in projects for making cities smarter in Italy in 2019, by area [Graph]. In Statista.

Even in the local public sector, some barriers inhibit full implementation of strategies that secure the framework created by Smart Cities, such as lack of expertise and knowledge, limited funding, lack of collaboration, and incapacity to project the use of economic resources and technologies. To overcome these limits, a Smart City needs motivated workers with a forward-thinking attitude, collaboration with different stakeholders, participation, and partnerships. Here are some insights from a statistic elaborated over the 2018-2019 timespan.

Figure 21. Main barriers to implementation of smart city projects in Italy, 2018-2019.



Source: Osservatori Digital Innovation. (April 7, 2020). Main barriers to implementation of smart city projects in Italy in 2018 and 2019 [Graph]. In Statista.

Chapter 4: Eco-Cities from the perspective of security

4.1. Eco-Cities: the intersection between security and sustainable development

Recalling what emerged in chapter 1, as new urban models are trying to create a bridge between balancing social, economic, and security standards, and climate change is acknowledged as a security hazard threatening ecosystems' sustainability and mankind's peace and future, the Eco-City model actualises the relationship between environment, sustainability, and security.

The concept of security that will be studied henceforth relates to human security, food, water, and health, as the specific conditions provided by the urban environment impact, positively or negatively, on them.

Sharing the assumption that "societies flourish when their living spaces allow continued development and progress[179]", in the era we live in, it is essential to invest in sustainability and justice, also understood in social terms, to create strong, cohesive, resilient, and sustainable development-oriented communities able to contrast the exponentially growing damages caused by climate change.

This necessity has been understood by cities, the first called upon to engage in the implementation of strategies that provide valid support to citizens, making them safe from several forms of risk and consequently ensuring the implementation of urban security, namely measures in favour of the liveability and decorum of the urban spaces.

One tactic worth of mention is the Eco-City model, both a concept and a practice that responds to the need to take sustainability at the urban level and offers the development of new habits, infrastructures, production, and consumptions patterns on the urban scale, manifesting itself as a viable solution to sustainable living in a framework of security.

The decision to invest locally is driven, as mentioned earlier in this paper, by the projected growth of the global population, which, either by birth or by relocation, will occupy cities rather than rural areas. In this scenario, the best way forward is to focus on creating spaces in which the community can live in comfort (human, social, and economic), in conditions of peace, and security, as has already been recognised by the New Urban Agenda document, asserting that

> "populations, economic activities, social and cultural interactions, as well as environmental and humanitarian impacts, are increasingly concentrated in cities, and this poses massive

[179] Elnokaly, A., & Elseragy, A. (2017, June). Eco-cities: strategies of rebuilding communities for resilient and sustainable development in Egypt with particular emphasis on Aswan. In *Proceedings of the International Conference on Changing Cities III: Spatial, Design, Landscape & Socio-Economic dimensions*. EG Press.

sustainability challenges in terms of housing, infrastructure, basic services, food security, health, education, decent jobs, safety and natural resources, among others[180]".

Additionally, considering the inevitable occurrence of external shocks that will affect the wellbeing of citizens, local governments must also be prepared to focus on tools and measures to make communities resilient, thus able to absorb negative externalities and recover from them.

To ensure urban resilience, there are four indicators or dimensions, that, according to the UN, must be met: people, organisation, place, and knowledge. More specifically, adequate health conditions must be ensured for all citizens, even the most marginalised strata of the population; economic and social systems must be well organised and structured; the quality of urban spaces and public infrastructure must be high and constantly guaranteed through maintenance, extraordinary restructuring interventions and controls; and, finally, leadership – institutional and otherwise – must be able to make good decisions tailored to the society it administers, use dialogue with all stakeholders, and recognise past mistakes and processes so as not to repeat wrong decisions.

In principle, good strategies, or at least starting points, for strengthening and creating communities suitable for living in the Eco-City model can be the promotion of cultural, historical, and social heritage, without forgetting the importance of integration and peaceful coexistence with other communities, investments in sustainable mobility and clean energy, as they are useful elements facilitating urban life, respect for local customs and traditions – including the culinary and religious ones – protection of human life through sustainable food, water, energy, and health policies, respect for the law – a fair law that aims to preserve resources for current and future use – justice, and equality, safeguarding biodiversity and the ecosystem, thus adopting lifestyles that allow harmony with nature.

All of this is because sustainability is not only about green policies, but it expands beyond to affect the way individuals relate to each other.

Consequently, governments truly interested in making a shift towards sustainable urban lifestyles and therefore committing to the concretisation of practices belonging to the Eco-City model have to promote and maintain wide networks of safe, inclusive, accessible, well-connected, and high-quality public areas; enhance the resilience of cities to climate variations and disasters such as floods, heatwaves, and soil overexploitation; guarantee food security and nutrition, water, and energy security; appropriate levels of air quality and limit pollution and pollutants to safeguard human health; ensure access to sustainable, proper, affordable, and safe housing, services, and infrastructures, to preserve citizens' wellbeing.

[180] United Nations, (2017). New Urban Agenda, ISBN: 978-92-1-132757-1.

More in detail, specific governmental commitment is required for the realisation of properly designed streets and public spaces that must be safe, accessible, green, and functional, as well as free from crime and violence thanks to the constant monitoring and intervention of law enforcement authorities. People need to be encouraged to experience and use public spaces through the promotion of walkability and cycling, so as to improve health and wellbeing.
Moreover, new urban planning strategies need to be appointed to facilitate the granting of affordable and safe housing, basic services, social and intergenerational interactions to prevent the stigmatisation of specific groups, acceptance of cultural diversity, and, last but not least, safety and security. As a consequence, measures to counteract crime, violence, terrorism, and extremisms have to be created and integrated into the relevant local communities, involving governmental and non-governmental subjects, not to mention the importance of providing the right training for those professions that find themselves to operate in the field of urban security.

4.2 Defining the Eco-City model

The term to describe sustainable cities was coined by Richard Register, who was looking for a word to illustrate a town where human beings could exist in harmony with nature and reduce their ecological footprint[181].

Hence, in this urban context, it is possible to live with minimal impact on nature and natural resources, keeping the ecosystem and its inhabitants healthy throughout their lives by avoiding over-exploitation and over-consumption of energy, water, food, and fossil fuels.

However, in an Eco-City, the focus is not only and exclusively on the environment and sustainability issues. Indeed, as the World Bank has recognised, this urban model creates "economic opportunities [...] in an inclusive, sustainable, and resource-efficient way" while "protecting and nurturing the local ecology and global public goods, such as the environment, for future generations[182]".

As is customary with the many crosscutting concepts that are debated at the academic, political, and social level, it is not easy to find a single, universal definition of Eco-Cities, a model that in many ways overlaps and mixes with another concept, that of Sustainable Cities.

[181] Koh, K. L., Gunawansa, A., & Bhullar, L. (2010). " Eco-Cities" and" Sustainable Cities"-Whither?. *Social Space*, 84-92.
[182] World Bank (2009) Eco2 Cities: Ecological Cities as Economic Cities Program, http://preview.tinyurl.com/ecocitiesfullreport.

In this thesis, in order not to create confusion and over-categorise, every reference to the Eco-City refers to a model featured by high-tech urban agglomerations that allow each citizen to satisfy their needs and maximise their well-being without harming the environment or other individuals[183], as they can live in an "environmentally safe, socially inclusive, and economically productive space[184]". The energy sources are renewable, agricultural land is found on rooftops or indoor, emissions of harmful substances are reduced to the minimum.

For this to be possible, an Eco-City should be small in size – or at least have an urban architecture that rationalises and organises public spaces as much as possible – and be consistent with the social and economic priorities of the local community, which must be included along with public and private bodies to ensure the constant circulation of information that demonstrates how the benefits of this urban model are concrete, lasting, and relate to many sectors.

Figure 22. Eco-City's urban planning.

Source: https://humphreys.com/project/ecopark-villa/hpa-urban-architecture-ecopark-villa-master-plan/

Inevitably, an Eco-City must also dispose of the appropriate technologies and interconnections typical of a Smart City to ensure the proper functioning of key infrastructures that guarantee the use of primary goods and services (energy efficiency, sustainable building, recycling practices, urban agriculture).

[183] H. Girardet, Cities People Planet: Liveable Cities for a Sustainable World 6 (Chichester: John Wiley & Sons, Incorporated, 2004).
[184] UN-HABITAT (2009), Planning Sustainable Cities – Global Report on Human Settlements 2009, 113.

Many pivotal aspects characterise an Eco-City: the urban planning *(i)* safeguards the biodiversity, environment, food and water-producing areas, *(ii)* encourages the sustainable alternatives to car and motorcycle transportation, *(iii)* relies on crossing edge technologies for water, food, energy, and waste management, *(iv)* creates buildings – especially public ones – robust and personalised for citizens' needs, *(v)* aims to maximise the economic and social performance of the city through innovation, sustainability, inclusion, equity, and safety that are pursued through inclusive, empowering, and democratic decision-making processes.

The local urban management is required to guide the city towards sustainable and safe attitudes, thus committing to integrate the administration of water and energy resources to reduce GHGs, fostering the implementation of campaigns for recycling and proper waste disposal, so as not to compromise the health of individuals and the soil, as well as facilitating the implementation of the circular economy, and promoting social justice, to facilitate the maintenance of urban safety. Thanks to a fair and equitable distribution of benefits, goods, and public services, conditions such as marginalisation, social tension, and poverty can be reduced, thus avoiding those situations of discomfort that could lead to violence or crime.

In addition, we need more Eco-Cities, or at least cities that are willing to enucleate this vision and the changes it entails, for several reasons. Above all, an environment compromised by climate change, uncontrolled urbanisation, harmful gas emissions, and the uncontrolled exploitation of natural resources leads to their inevitable deterioration and depletion, thus threatening the sphere of human security, as it is affected by access to food, clean water, housing, employment, and lack of health risks[185].

Investments and attitudes to boost eco-efficiency and eco-lifestyles require a synergic modification – and evolution – in culture, institutions, and technology. Especially the latter is in the spotlight, as now environmental technologies need to be calibrated on the needs that the cities of the future try to satisfy.

4.3 Security benefits deriving from the Eco-City model

[185] As pointed out in the work Adger, W. N., Pulhin, J. M., Barnett, J., Dabelko, G. D., Hovelsrud, G. K., Levy, M., ... & Vogel, C. H. (2014). Human security. Cambridge University Press, climate change and its adverse effects have a negative impact on human security because they jeopardise livelihoods, culture and identity of peoples who are often forced to migrate in search of safety. They can also undermine the government's ability to make accurate and correct decisions in support of the population. Furthermore, the occurrence of droughts, famine, conflicts, tensions and social, political and economic instability could expose some layers of the population to greater risks, leading to a decrease in the security that public authorities should guarantee. To contrast these circumstances, Eco-Cities could be of help.

The benefits of the Eco-Cities urban model are manifold and have to do with security in a transversal sense, as they manifest in environmental, human, energy, food, and water security.

This section will proceed gradually, first introducing the positive contribution that Eco-Cities make to the circular economy paradigm, and then focusing more on the dimension of food security, to then cover the one of health, water, and energy.

The introduction of and adaptation to Smart Cities and smart technologies is not enough to counter social and environmental risks. The subsequent effort is to join a new conceptual paradigm and lifestyle, synthesised by the circular economy, which is facilitated by the Eco-Cities urban model.

Indeed, Earth presents us with a hefty bill to pay for our negligent actions, long-term unsustainable lifestyles, and blindness to climate change, and in the last years, the growing awareness of these dangers has given rise to a vision developed at a conceptual level and practically applicable through institutional, infrastructural, corporate, and social commitments that allow concrete steps towards an unprecedented political, cultural and entrepreneurial change to be taken.

This circular model of production and consumption – whose keywords are sharing, reuse, reconditioning, and recycling materials to make them usable for as long as possible – makes it possible to extend the life cycle of products and, reduce waste and scraps to a minimum. The concept of circularity is reinforced by the reinsertion of the components of any product that has finished its function in the economic cycle, so that each constituent part can continue to be exploited in the production cycle, generating new value.

This attention towards the increase of product utilisation even after its "expiration date" is a pivotal element that contributes to creating new jobs, new markets, and a new production manner, by making it self-sufficient, as well as supporting the introduction of waste-free technologies[186]. All of this, in the broader picture of sustainable development.

The Eco-Cities and the circular economy paradigms take concrete form in the urban context and help to counteract the trend towards uncontrolled urbanisation by reconciling it with sustainable development. It is in this way that, with the application of new policies and the creation of new infrastructures, the city becomes the scene of a new eco-culture. Indeed, the social fabric and the very physical composition of the city must be adapted and modified to achieve a new form of the ecosystem and human security, and in this process, the many opportunities that the city offers emerge,

[186] Rudskaya, E. N., Eremenko, I. A., & Yuryeva, V. V. (2019, December). Eco-cities in the paradigm of a circular economy and a comprehensive internet. In *IOP Conference Series: Materials Science and Engineering* (Vol. 698, No. 7, p. 077023). IOP Publishing.

as enabling the community to change its habits and harmonise its interpersonal relationships and those between man and nature.

In this process, the reliance on the IoT cannot be neglected. Therefore, the technologies used in the Smart Cities are also present in Eco-Cities, where they are further developed in the circular economy perspective and to satisfy the standards required by the dictates of sustainable development.

A clear example is the use of an innovative technique employed in urban agriculture called hydroponics, or the use of sustainable means of transport powered by renewable energy, as well as the use of eco-materials (from floor tiles that store energy and reuse it for street lighting, to smog-absorbing paints for building facades).

Shifting the attention to food security, it is important to consider how this concept has evolved, moving from being merely anchored in food availability and food production, towards encompassing accessibility to food in physical, economic, and social terms, its utilisation, and then, also covering the sustainability dimension, which is increasingly emphasised by international organisations.

The term and its relative significance emerged with the growth and spread of global food crises that continue to this day. In the early 1970s, changes in the prices set by food providers combined with events such as famine and widespread hunger led to the need to rethink the concept of food security by focusing on the most fragile and vulnerable people. Therefore, in 1974 the World Food Conference defined food security as

> "the availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices[187]",

and subsequent action on the balance between supply and demand-side has led to a further definition:

> "to ensure that all people at all times have both physical and economic access to the basic food they need[188]".

In 1986, with the World Bank, a time scale for food security was introduced, differentiating between chronic food insecurity linked to poverty problems, and transient food insecurity induced by natural or human-induced disasters. As a consequence, food security started to be intended as "access of all people at all times to enough food for an active, healthy life".

[187] United Nations (1975) Report of the World Food Conference, Rome, 5–16 November 1974. New York: UN.
[188] Food and Agriculture Organization of the United Nations (1983) World Food Security: A Reappraisal of the Concepts and Approaches. Director General's Report. Rome: FAO.

A further step was taken in 1994 when it was decided to integrate the notion of human security with that of food security, analysing the spectrum of human rights and the broader context of social security. In this way, it was finally accepted and declared that food security is a problem that affects both the local and global levels, and very often presents itself as a multidimensional and multifaceted challenge. Thus,

> "food security, at the individual, household, national, regional and global levels, is achieved 'when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life",

as the World Food Summit in 1996 asserted[189].

However, this long evolutionary path was joined in 2001 by a reflection on nutrition security, recognising food security as the condition in which

> "physical, social and economic access to sufficient, safe and nutritious food that meets […] dietary needs and food preferences for an active and healthy life"

is guaranteed[190].

The evolution and all-embracing nature of this notion have led to reflection on its multiple implications in terms of price volatility, investments in agriculture, climate change, social protection, investments in biofuels, food losses, and waste. In the light of this, it is possible to identify a link between this theme and the provision by local authorities of urban security and we also understand why it is relevant in Eco-Cities, given that following recent dynamics the food security goal is increasingly associated with the concept of sustainability[191].

It is no coincidence that the International Food Policy Research Institute has developed a 2020 Vision of a world in which

> "every person has economic and physical access to sufficient food to sustain a healthy and productive life, where malnutrition is absent, and where food originates from efficient,

[189] Food and Agriculture Organization of the United Nations (1996) Rome Declaration on Food Security and World Food Summit Plan of Action. Rome: FAO.
[190] Food and Agriculture Organization of the United Nations (2002) The State of Food Insecurity in the World 2001. Rome: FAO.
[191] Berry, E. M., Dernini, S., Burlingame, B., Meybeck, A., & Conforti, P. (2015). Food security and sustainability: can one exist without the other?. *Public health nutrition*, *18*(13), 2293-2302, page 2295.

effective, and low-cost food and agricultural systems that are compatible with sustainable use and management of natural resources[192]".

References to health and malnutrition imply the other side of the food security coin, namely food insecurity. Indeed, this aspect needs to be investigated to understand the challenges faced by local and global authorities and the consequent policies to be put in place to solve and ameliorate the situations of human suffering and national imbalances.

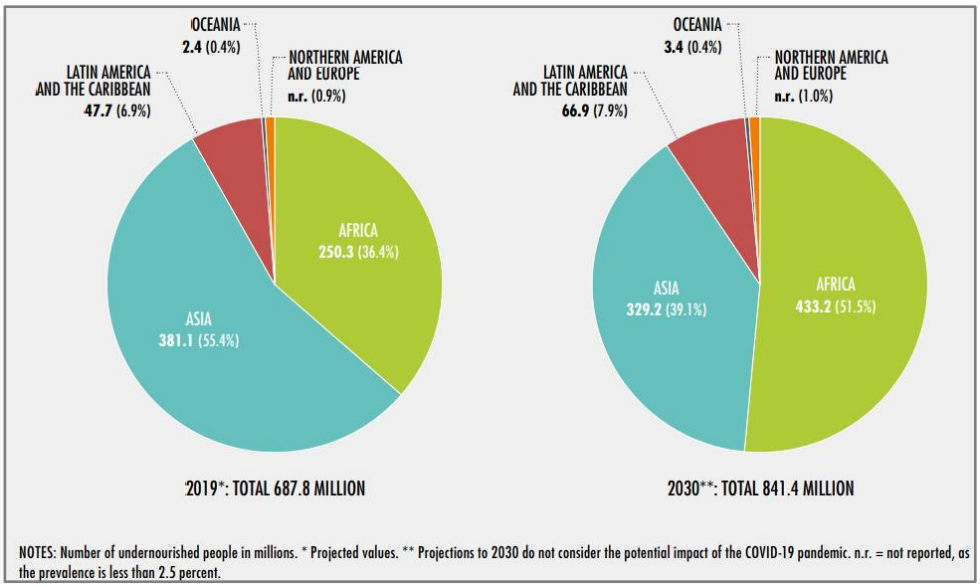
About 800 million people around the world experience food insecurity, lacking access to food or the basic intake of nutrients needed to lead a healthy life; 20% of the world's population in developing countries lacks the economic resources to ensure access to food, and very often the victims are children not only underweight but also in vitamins and nutrients deficiency, becoming fragile individuals, vulnerable to many diseases and infections[193].

In a scenario of rapid urbanisation that does not take into account the principles of sustainable development, food insecurity is bound to increase in parallel with deforestation, use of agricultural products converted to biofuels or used as feed for farm animals, decrease in land and water available to humans and used for cultivation, and increases in food prices.

To give an idea of the current situation, the State of Food Insecurity and Nutrition in the World 2020[194] estimated that approximately 690 million people are hungry, in 2019 2 billion people in the world did not have regular access to safe, nutritious, and sufficient food, and, if these trends are not stopped, by 2030 the number of people affected by hunger would surpass 840 million and will cause geopolitical tensions, as the geographical distribution of hunger in the world will change making Africa the region with the highest number of undernourished (according to projections that did not take into account the disruptive impact of COVID-19).

[192] Pinstrup-Andersen, P. and Pandya-Lorch, R. (1998). Food security and sustainable use of natural resources: a 2020 vision. Ecological Economics 26 (1): 1–10.
[193] Ferranti, P. (2016). Food Sustainability, Security, and Effects of Global Change. Reference module in food science. Elsevier. https://doi.org/10.1016/B978-0-08-100596-5.03445-4.
[194] Released by the Food and Agriculture Organization, the International Fund for Agricultural Development, UNICEF, the World Food Programme, and the World Health Organization.

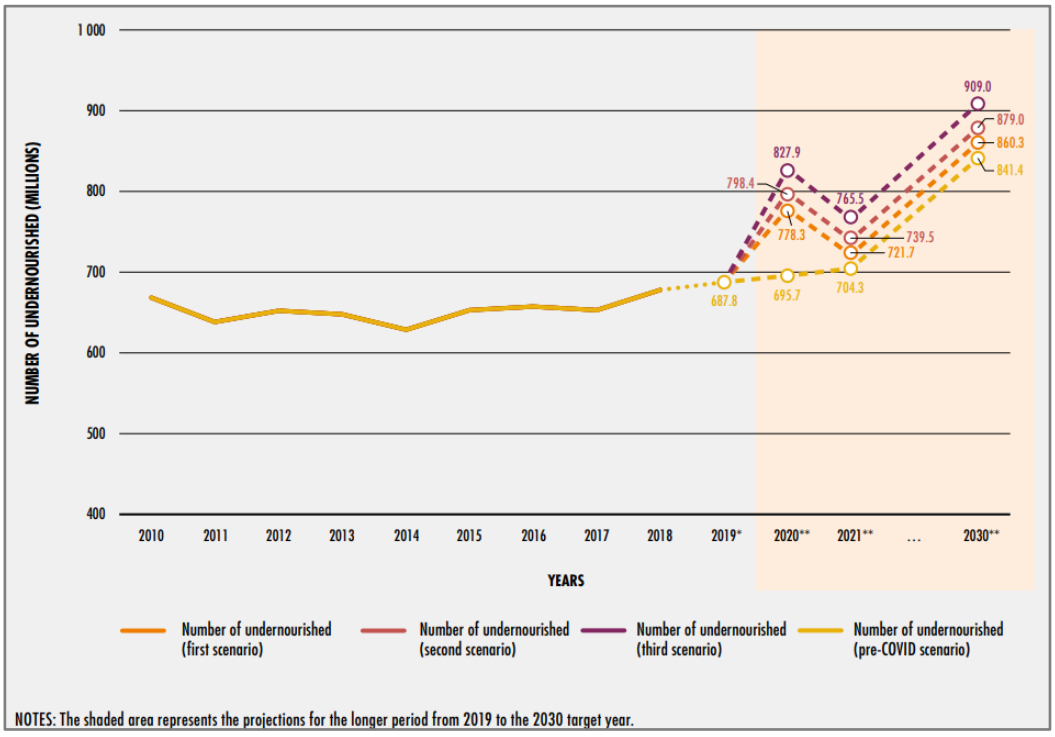
Figure 23. Distribution of hunger in the world.



Source: World Health Organization. (2020). The state of food security and nutrition in the world 2020: transforming food systems for affordable healthy diets *(Vol. 2020). Food & Agriculture Org, page 16.*

Considering the COVID-19 pandemic spreading across the world, more people are expected to be exposed to food insecurity, as the following graph and its different scenarios demonstrate.

Figure 24. Covid-19 and global hunger: three scenarios.



Source: World Health Organization. (2020). The state of food security and nutrition in the world 2020: transforming food systems for affordable healthy diets *(Vol. 2020). Food & Agriculture Org, page 17.*

When food security is analysed from a local perspective, a link emerges between food instability and poverty. In many areas where households have a low average income, infrastructure is often inadequate, exposing the community to food insecurity. Indeed, low-income urban residents' access to food depends on physical and financial factors, and the availability of affordable food markets, or urban and peri-urban agriculture, that offer the possibility to have a healthy diet becomes pivotal. These healthy eating habits are demonstrated to be five times more expensive than other diets and are considered to be unaffordable for more than 3 billion people in the globe.

Nonetheless, appropriate food consumption patterns are crucial to reducing mortality and non-communicable disease risks, thus even lessening the respective health costs[195], not to mention the important influence they have on climate change, as unsustainable and unhealthy dietary habits entail the social cost of GHGs emissions.

Considering the relationship between climate change and food security, it is worth mentioning that in food supply two are the most important elements: natural resources and agriculture (industrialisation). Without a regime of well-established standards and limits, relying on natural resources to secure food supply can negatively affect soil, green areas, and groundwater. Deforestation, conversion of woodlands to agricultural land, overharvesting, and intensive fisheries are some of the many practices that are unsustainable in the long run and act as accelerators of climate-related events such as droughts, floods, and desertification that might negatively impact food security. The same line of reasoning could be applied to the agricultural industrialisation practices that heavily rely on pesticides and fertilizers to grow certain species of food on land where they would not otherwise grow, to eliminate the risk of insect fauna spoiling the harvest, or to increase production and thus profits. When these substances are used to support food production capacity, they could also be considered as means bolster to food security. However, reflecting on the chemical compositions and the harm that processed foods can cause to humans would easily invalidate the previous consideration.
A further element that undermines food security is characterised by national and international situations of risk, vulnerability, or instability[196] which, however, will not be examined in this paper because they are out of the scope of the local dimension here assessed.

Bringing the attention back to climate change and food security, one of the several challenges of the 21st century is to minimise the risks that climate variation poses to food security and, vice versa, to

[195] Computations refer to a reduction of up to 97% in direct and indirect health costs.
[196] Civil wars, conflicts, economic crises and so on so forth.

ensure that food availability and adequate nutrition values are offered to people without endangering the environment[197].

As asserted in the State of Food Insecurity and Nutrition in the World 2020, each state should rebalance its agricultural policies and incentives

> "towards more nutrition sensitive investment and policy actions all along the food supply chain to reduce food losses and enhance efficiencies at all stages".

Hence, a strategic move would be to invest in crop-climate modelling[198] to develop future-oriented agricultural viewpoints able to guide policymakers in their choices. Based on these estimates, it is thought that due to advancing adverse phenomena caused by climate change, global crop production will decline[199] and there will be a reduction in feed quality and quantity, as well as changes in pesticides and food-borne diseases.

Then, new scope-oriented studies are needed as consumption in some edibles is changing, and the scientific community is lacking precise research on how climate change impacts the agri-food branch. What is known is that the adverse effects of climate change negatively affect all dimensions of food security, namely food availability, access, utilisation, and stability. Therefore, in order to achieve food security in the context of climate change, it is necessary to focus on local public policies that ensure the availability of good nutrition to individuals and households and that act on the reduction of food waste. This is because people's ability to access food via purchase will change, as food prices are expected to dramatically increase, and transport systems too might be affected by territorial variations.

Primarily, two dimensions of food security may pose a threat to the well-being of individuals: food safety through the supply chain and health impacts. Indeed, climate change is likely to generate food insecurity because as temperatures or physical conditions change in different environments, new microorganisms – potentially harmful to humans – may flourish.

However, it would not be fair to mention just food-related vector-borne diseases. It is important to go further also considering heat stress, natural disasters, and water-related problems. Then there are also indirect effects of climate change such as job losses, which make it impossible for people to access

[197] That is to say, by identifying new systems that secure food provision through low emissions pathways.
[198] Campbell, B. M., Vermeulen, S. J., Aggarwal, P. K., Corner-Dolloff, C., Girvetz, E., Loboguerrero, A. M., ... & Wollenberg, E. (2016). Reducing risks to food security from climate change. *Global Food Security*, *11*, 34-43.
[199] Porter, J.R., Xie, L., Challinor, A.J., Cochrane, K., Howden, M., Iqbal, M.M., Lobell, D.B., Travasso, M.I., 2014. Chapter 7. Food Security and Food Production Systems. Climate Change 2014: Impacts, Adaptation and Vulnerability. Working Group II Contribution to the IPCC 5th Assessment Report, Geneva, Switzerland.

healthy diets, as they might be relatively expensive due to disrupted rainfall patterns, changes in temperatures, and soil degradation[200].

All the difficulties related to food security, and in this case insecurity, could be mitigated by careful planning of public security and welfare policies that, in the local context, are committed to ensuring the well-being of citizens. An Eco-City, or a Climate-Smart village, could offer a good solution, as all stakeholders such as urban and rural communities, politicians, farmers, livestock breeders, and multinational agribusinesses could define together, and in the light of their different interests, the goals, and standards for implementing climate-smart agriculture that would bring out productivity, ethical profits, availability of high-quality raw materials, and sustainability.

In detail and technical terms, what the urban model of the Ecological City can offer is *(i)* an agroecological oriented analysis of public and private soil to strategically design food production, *(ii)* implement climate-smart technologies to invest in water-smart practices like rainwater harvesting and micro-irrigation, in weather-smart activities, nutrient-smart practices such as precision fertilizers and site-specific nutrient management, as well as carbon and energy-smart practices, and *(iii)* facilitating community partnerships[201].

The immediate challenges that Eco-Cities can confront are *(i)* to drive research in the field of agri-food security and sustainability, *(ii)* to design and implement new context-specific policies and prioritise community welfare, *(iii)* to foster social inclusion by safeguarding the most vulnerable groups, and to *(iv)* enhance urban food security through strategies such as mitigation and adaptation of the agri-food sector concerning climate change.

From here on, consistently with previous references to the importance of agriculture in ensuring food security, a very specific dimension of this practice will be analysed, namely urban agriculture.

As worldwide land is degraded due to erosion and human overexploitation, new land is needed for cultivation, but finding it is expensive and unsustainable. Therefore, to ensure food security at urban and global level, agricultural systems need to be transformed and adapted to the challenges of our times. Just to mention, here are some actions needed: stopping the expansion of agriculture, closing and reconverting insufficiently productive farmland, improving the management (and making it more

[200] Tacoli, C. (2013). Urban poverty, food security and climate change. *IIED Briefing Paper-International Institute for Environment and Development*, (17149).
[201] Campbell, B. M., Vermeulen, S. J., Aggarwal, P. K., Corner-Dolloff, C., Girvetz, E., Loboguerrero, A. M., ... & Wollenberg, E. (2016). Reducing risks to food security from climate change. *Global Food Security*, *11*, 34-43, page 38.

sustainable) of agricultural resources such as irrigation, lighting, labour, changing eating habits to make them healthier, and modifying food transportation and delivery.

Fundamental is to re-use and use vacant spaces in cities to decompensate land loss and take pressure from rural agriculture[202], and this is what is fostered in Eco-Cities, as lots are turned into urban vegetable gardens, private or communitarian, with active attention towards the levels of food security granted to densely populated areas and undersupplied suburbs.

The practice of urban agriculture is complementary to the well-known one of rural agriculture. In the urban context, it is a measure that evolved over centuries to bolster food security and it is now considered as a powerful tactic that contributes to food resilience, minimises transportation costs, relieves the poorest from economic pressure and dependency as it enables those communities to be self-sufficient, creates jobs, community health and empowerment, as well as urban beautification[203]. On the other hand, it might also be vulnerable to pollution risks deriving from the city that contaminates food products through heavy metals or harming chemicals, which could lead to higher maintenance costs, or create competition between small farmers. However, under proper regulation it is possible to affirm that urban agriculture represents a viable solution to the urban food insecurity phenomenon, and it fits the current necessity to protect and increase citizens' wellbeing while introducing new sustainable technologies that allow customised production processes.

Urban agriculture is defined as

> "an industry located within a town, a city or metropolis, which grows or raises, processes and distributes a diversity of food and non-food products (re-)using largely human and material resources, products and services found in and around that urban area, and in turn supplying human and material resources, products and services largely to that urban area[204]"

and it not only provides the community with an appropriate amount of nutrients, but it also presents a solution to the future food needs of cities that will experience increasing migration from rural areas, and it contributes to reducing the city's ecological footprint[205]. The latter point coincides with the application of a sustainable agriculture methodology, which must satisfy four requisites: *(i)*

[202] Eigenbrod, C., & Gruda, N. (2015). Urban vegetable for food security in cities. A review. *Agronomy for Sustainable Development*, *35*(2), 483-498.
[203] Lindemann-Matthies, P., Brieger, H., 2016. Does urban gardening increase aesthetic quality of urban areas? A case study from Germany. Urban For. Urban Green. https:// doi.org/10.1016/j.ufug.2016.03.010.
[204] Mougeot LJA (2000) Urban agriculture: definition, presence, potentials and risks. In: Bakker N, Dubbeling M, Gündel S, Sabel-Koschella U, de Zeeuw H (eds) Growing cities. Growing Food. Dtsch Stift int Entw, Feldafing, pp 1–41.
[205] By protecting and enhancing biodiversity, recycling urban wastes, stimulating urban economies by promoting self-sufficiency and reducing dependency on global food markets.

production of an adequate food supply, *(ii)* alleviation of poverty, *(iii)* better health and nutrition for the entire population, and *(iv)* safeguard of natural resources.

This low carbon impact and the greater facility in food production meet the present values of urban lifestyle, especially in developed countries, where this practice is also used to increase social interactions and cohesion (thus facilitating the affirmation of urban security conditions)[206], aspects that play an important role in the affirmation of social cohesion among citizens, thus needing to be safeguarded. Nonetheless, in developing countries, urban agriculture is not mainly used to achieve social goals, rather as a contribution to the basic needs satisfied by food security – namely food availability, food access, food utilisation, and food stability.

The Eco-City model envisions the city as a place of food production, and it encourages the development of urban agriculture in different forms to implement the principle of space-efficient food production and security. Therefore, urban spaces such as industrial and public building rooftops, and residential gardens are optimised.

There is the practice of home gardening, namely the cultivation of fruit and vegetables close to the home of the growers as a supplementary cheaper production of nutrients. However, what is need is appropriate irrigation that, to be sustainable, could derive from harvested water, rain, tap-water, or wastewater that must be treated to avoid risks to human health.

Another practice is community gardens, namely the collective cultivation of plants and food products by a certain number of people living in a specific area. Given these features, community gardening is generally carried out in public urban spaces to overcome individual problems such as lack of access to land and inadequate infrastructures. A sustainable feature of this technique is that vegetables can be cultivated in boxes and rice sacks to lessen the impact on soil and not further increase phenomena such as soil erosion, pollution, and loss of arable land. Closely related to this soilless culture is hydroponic, a system of water rich in minerals and nutrients that allow better plant growth. In developing countries, community gardening offers a viable solution to food security, as citizens are allowed to use shared land to guarantee their nutrition and, in a condition of reduced soil fertility, an organoponic system could be used, as it operates without fertilizers. In developed states, this practice responds to the desire of having a "greener city", establishing a sense of environmental responsibility, and educating people about social activities.

[206] Urban agriculture practices are useful in enhancing the social capacity to protect and nurturing urban green spaces in the neighbourhood, they provide local residents with experts' training and mentorship, and they attract different age and ethnicities groups, consequently contributing to urban security.

Vertical farming is another concept of urban agriculture, and it consists of plant factories where vegetables are cultivated indoors in a regime of strict control offered by sensors and computers that measure the environmental factors relevant for plant growth and intervene to regulate them. Some benefits of this technique are that food products are available all year round, as they do not depend on external climate factors, goods are free from contamination and the environment is completely protected with no risky pathogens. Lack of microbes to neutralise results in no pesticides or chemicals. The use of LED lighting reproduces for each plant its specific light wavelength for the photosynthesis process, 95% less water is used compared to traditional cultivation as this resource is filtered and recycled, and 98% less soil is used. Products are not stored in warehouses but sold as soon as they are harvested, guaranteeing freshness and quality.

Some possible downsides of urban agriculture promoted by Eco-Cities are the numerous costs involved in investment, infrastructure, technology, energy, equipment, automation, and surveillance to prevent the food and farming process from being jeopardised by third parties.

Biofuels are another sustainable alternative that Eco-Cities are promoting to meet another need typical of our times: sustainable mobility. Of course, the attempt is to offer viable solution to transport systems without invalidating food security.

Biofuels are bioethanol, biodiesel, and biohydrogen, namely renewable sources of energy that oppose fossil fuels. They are produced via feedstock such as crops and edible oils, but the risk is that they alter ecological balances, as countries could deforest areas to grow such resources. A solution is to invest in second-generation feedstocks, namely non-edible oils, restaurant wastes, and animal-derived waste oils, even if in performance terms, they are not excellent. Further investments in research identified the so-called third-generation biodiesel feedstocks, made of microalgae. Testing for other sustainable fuels will certainly not stop, and this will ensure that within the framework of an Eco-City it will be easier to continue to research and find products that do not contribute to the food vs. fuel war and do not generate food imbalances.

The future of urban food security will only evolve with a clear political and social intention for change, and in a context such as the one created by the Eco-Cities there is every reason to make this happen.

In those urban areas where the conditions for food security have not yet been realised, it is important to ensure that public authorities intervene to ensure that the right technologies and spaces are made available to people. Public and private investment in urban agriculture is needed to improve sectors

such as agronomy, plant breeding, and biotechnology, which are useful resources for improving food security, sustainability, and the lives of farmers and consumers.

All these initiatives will have to address both the production and consumption sides of the equation, thus creating citizen-friendly policies that minimise food insecurity. To avoid a food insecurity scenario leading to other forms of urban insecurity such as those analysed in chapter two, recognising a clear link between income poverty, urban poverty, and food poverty is the necessary step to develop social policies aimed at increasing employment rate.

In addition, further reasoning on raising minimum wages will be needed, although this measure alone is not enough. City authorities need to improve living conditions and protect the ecosystem in which people live to minimise collateral risks that could undermine food security and then affect urban safety. So, cities must welcome experiments in co-housing and co-production, as well as increasing the accessibility of markets to the poorest through ad hoc pricing and making nutrient production autonomous in urban spaces.

Some of the concrete strategies that can be implemented in Eco-Cities to positively impact food security and other related security spheres and drastically reduce urban insecurity related to these dimensions include *(i)* the physical protection of urban green spaces, *(ii)* the provision of incentives for growing food and the creation of urban farms, *(iii)* legal protection of green areas and those who care for them, *(iv)* community awareness through projects that teach respect for the ecosystem, and *(v)* free information provided to every member of the city about the benefits of a sustainable lifestyle and proper nutrition, *(vi)* the involvement of city planners to create and set up forms of urban agriculture in the appropriate spaces of the city in the wake of theories such as system ecology and landscape ecology, as well as *(vii)* promoting participation in political dialogue, so as to debate and deliberate on the future of the city and the safety and well-being of its inhabitants.

In the Eco-Cities there is a link between food security, environmental security, health, and natural resources.

Concerning how Eco-Cities support and promote ongoing improvements in the health of city dwellers, it should be recalled that any technique that promotes food security also has a positive impact on health and nutrition. In addition, the sustainable transport network that is promoted in such city model increases the opportunities for physical activity, such as walking, running, and cycling, which have an excellent impact on the physical and mental health of people and even reduce the use of polluting vehicles, thus improving air quality.

Moreover, effective urban management guidelines enforced by Eco-Cities can help cities to mitigate climate change and adapt to its impacts. The design of these cities allows them to be full of parks, green spaces, and roadside trees that regulate city temperature avoiding the disruptive problem of urban heat and its consequences on human health[207].

Figure 25. Liuzhou Forest City.

Source: https://www.italiani.it/citta-foresta-cina-la-eco-city-figlia-un-progetto-italiano/

The model considered in this chapter also deals with the issue of water security. This concept, applicable locally and globally, began to spread in the 1980s regarding integrated water management as a solution to water management problems. In 1990, the term sustainable water resources management emerged, following the spread of the sustainable development mindset, and in the 2000s, the need to adapt water management to climate change emerged, so as to ensure the safely continued availability of services.

However, talking about urban water security requires narrowing the focus and understanding, essentially, how much a given community depends on the natural resources, water in this case, of its hinterland. It goes without saying that a large and highly populated urban area is not self-sufficient, so, its local water resources are not able to meet the community demand, thus it is necessary to supply water resources from outside. As many studies have claimed, cities tend to need more water from outside their area than they need food, which is why the term "external water footprint" was coined, as this supply involves financial and environmental costs, such as construction, surveillance,

[207] A problem exacerbated by lack of vegetation.

maintenance of appropriate infrastructure, and transport, often not sustainable, to get the resource to its destination. Undoubtedly, this dependence on external resources creates new risks, thus requiring higher standards of protection and specific risk management plans.

When considering water security in urban settings, there is the tendency to think about well-being, social equity, sustainability, and minimising risks to citizens. Indeed, having a water system that takes advantage of the natural conformation and resources of the territory, that adapts to the urban agglomeration and does not disfigure it with its infrastructure, and that uses the most advanced technologies to increase the efficiency of the services offered, contributes to improving urban welfare in economic, social, environmental and satisfaction terms.

Moreover, if the proper use of water is not guaranteed, a large part of the population, often the most fragile fringe, risks finding itself in a state of water insecurity, which entails enormous risks in terms of health, as well as urban safety, given that malaise and social discomfort may lead to riots, vandalism, and violence. To prevent this from happening, local authorities – with the support of a typical Eco-City scheme of action – can expand the protection of this important resource towards the dimension of sustainability and equity, so as to ensure water safety in the long term and try to minimise as much as possible risks also from climate change and water-related diseases.

Living in a water security system improves living standards, leads to good governance that takes care of the most fragile and efficiently distributes a fundamental resource, and lessens the risks of social dissatisfaction that feed urban insecurity.

However, achieving and maintaining water security is not easy because in cities this resource is often subject to various social and environmental pressures. Regarding growing rates of urbanisation, the more a city and its population grow, the more the demand for water increases, leading to the risk of over-exploitation of surface and groundwater, water footprint growth, and unsustainable production or importation of water. These dangerous practices to extract more and more water also risk making the soil more fragile, endangering neighbouring inhabitants, and affecting water quality. In an Eco-City, such problems can be addressed and overcome through the promotion of sustainable use and re-use of water.

There are also environmental pressures, generated by hydrogeological instability and the geography of the city, which damage the urban water situation. These include an excessively arid climate, variability in precipitation, hurricanes, droughts and floods, erosion due to sea-level rise, and salinisation of groundwater. Problems of this kind can be solved by an Eco-City's focus on environmental issues and strategies for adapting to and resisting climate change. With this mindset,

it is possible to facilitate local authorities in implementing control and monitoring plans through the use of innovative technologies.

Overall, what this urban model proposes for water security is a set of environmentally sustainable infrastructures and practices that can reduce social and environmental pressures on water and water-related services. Therefore, encouraging the installation of household groundwater wells in urban areas where the piped water supply system is inadequate, rationalizing water supply according to the time of year and temperature, avoiding wasting water and reusing – and properly purifying – water that the population has already used are some of the measures carried out in cities that are committed to being green. In addition, it cannot be ignored the quantification of the risks that a city experiences from the point of view of water insecurity, to be able to carry out timely analyses that assess, create adequate responses, invest, and make operational decisions consistent with the territorial condition that is experienced[208].

Moreover, the Eco-City paradigm involves functional changes on another level, that of urban energy, contributing to the achievement of energy security, intended by the International Energy Agency as the "reliable, affordable access to all fuels and energy sources".

Today, to meet the challenging emission targets set by the Paris Climate Agreement, every country, and consequently all cities, is called upon to move towards decarbonising its energy system. To be more precise, in order to limit the risks of climate change, the energy sector plays a key role, as four of the SDGs recall: good health and wellbeing (SDG 3), affordable and clean energy (SDG 7), sustainable cities and communities (SDG 11), and climate action (SDG 13). Therefore, climate policies to be adopted at the urban level include actions related to the decarbonisation of energy production.

The focus on cities derives from the fact that they are areas characterised by extremely heterogeneous and energy-intensive consumption profiles, to the extent that about two-thirds of global primary energy consumption is attributed to urban areas, with a significant impact in terms of emissions and pollution[209].

Projections of population growth only exacerbate the estimates of GHGs emissions, since as the population increases, energy needs and the resulting pollution will surge, unless we start investing massively in renewable energy technologies. Following this reasoning, Eco-Cities seek to offer

[208] Hoekstra, A. Y., Buurman, J., & Van Ginkel, K. C. (2018). Urban water security: A review. *Environmental research letters*, *13*(5), 053002.
[209] Nik, V. M., Perera, A. T. D., & Chen, D. (2021). Towards climate resilient urban energy systems: a review. *National Science Review*, *8*(3), nwaa134.

concrete strategies to make decarbonisation a reality. Among these measures, three can be listed and considered the most widespread: *(i)* using less carbon-intensive fuels in the energy supply mix of urban buildings, *(ii)* increasing reliance on energy-efficient end-use equipment, and *(iii)* improving the thermal properties of buildings[210]. Additional to these strategies are also heat pumps and bioenergy, which Eco-Cities seek to promote as alternatives in many end-use energy sectors (power, fuels, thermal)[211].

Reducing energy consumption and increasing the supply of sustainable energy is possible thanks to the many technological innovations developed in recent years, not to mention those still in the planning and implementation phase. Thinking of (public) lighting, which has a huge impact on urban safety, switching from traditional incandescent lamps to compact fluorescent ones increases efficiency, as does electrifying buildings' energy that allows greater flexibility and reduces emissions and the subsequent costs, rather than continuing to use traditional fossil fuels (unsustainable because of their long-run climate constraints). Furthermore, living in a city that harnesses the light and warmth of the sun, as well as the power of the wind, to generate energy, means fitting fully into the paradigm of ecological security and lifestyle.

Obviously, Eco-Cities, using the IoT at the heart of Smart Cities, can optimise the storage, supply, and consumption of energy, reducing or avoiding energy waste. However, an urban system that relies only on renewable energy for its subsistence may incur some risks, most of which are climate-related. Adverse or abnormal weather conditions (due to climate change) could put energy storage at risk, as could system failures in the infrastructure that provides sustainable energy.

To overcome such obstacles, the ecological city must also be resilient, namely able to respond to a systemic disturbance without completely interrupting its services, monitor, prevent and reorganise itself during hazardous events, and be flexible and resilient in the face of external and internal shocks[212].

A further element that leads to the emergence of the Eco-City paradigm is the fact that human existence depends on food and water, as does development on energy. These resources are different but linked to the extent that the literature speaks of the water-energy-food nexus. The synergy that exists between these resources can be identified in food availability, utilisation, production, aid, and

[210] Leibowicz, B. D., Lanham, C. M., Brozynski, M. T., Vázquez-Canteli, J. R., Castejón, N. C., & Nagy, Z. (2018). Optimal decarbonization pathways for urban residential building energy services. *Applied energy*, *230*, 1311-1325.
[211] Arabzadeh, V., Mikkola, J., Jasiūnas, J., & Lund, P. D. (2020). Deep decarbonization of urban energy systems through renewable energy and sector-coupling flexibility strategies. *Journal of environmental management*, *260*, 110090.
[212] See note 208.

stability, water access, safety, distribution, aid, quality, and affordability, and energy continuity, aid, distribution, availability, supply to demand, and security[213].

Water is necessary for food, as well as energy is. Food influences water and energy demands. Energy deals with water and with food. The interdependencies among these elements must be enshrined in the creation of policies concerned with the security of the three of them, and this can happen in the Eco-City model, as it fosters a holistic approach to the sectors related to citizens wellbeing.

[213] Pachapur, P. K., Pachapur, V. L., Brar, S. K., Galvez, R., Le Bihan, Y., & Surampalli, R. Y. (2020). Food Security and Sustainability. *Sustainability: Fundamentals and Applications*, 357-374, page 367.

Conclusion

The objective of this thesis was to analyse the impact that climate change has on security – intended as the protection of individuals, organisations, and assets from external threats – and safety – the feeling of being secured from factors that cause harm – by bringing the study to the local framework, consisting of cities. This choice derives from the fact that the social, economic, and environmental events taking place at the urban level can and should be studied in terms of security, such as air and water pollution, land depletion, GHGs emissions, unsustainable energy production, ineffective waste management, improper urban design and associated community fragmentation, social turmoil, problematic mobility, traffic congestion, ineffective availability of public goods, outdated infrastructures causing technical and physical problems, decrease in public safety, and health services. Indeed, peace, wellbeing, and environmental security are intertwined, meaning that they require comprehensive policies to be achieved, and the thesis assumed that comprehensive strategies for mitigating, counteracting, and adapting to climate change can be devised, implemented, and controlled with better results if located in the urban context, rather than the global setting.

In the dissertation, it was repeatedly stressed that cities are complex and constantly evolving social, economic, and security-related entities, capable of adapting to the challenges of the moment, including the need to combine security with sustainability and technological development. From this connection, the intention was to demonstrate that there are two urban models, Smart Cities and Eco-Cities, which can have a significant impact on urban security, neutralising or minimising situations of risk and offering new sustainable solutions to everyday life.

In these two urban models, the nexus between risk and violence reduction, human welfare, and environmental protection is realised, because, through their technologies, urban planning strategies, and usability of services, they pursue well-being through mitigation, adaptation, and recovery from the negative consequences of climate change. All the measures taken in this direction also aim to counter the onset of environmental insecurity in addition to urban insecurity, and therefore there is ample reference to the practices, measures, and tools made available by Eco-Cities and Smart Cities to avoid marginalisation, stigmatisation, political instability, poverty, disease, scarcity of resources and public goods, as well as social discomfort and malaise that could lead to violence.

Because of this, it is important to emphasise how crucial it is to continue to provide space for research and debate on issues related to climate change and urban security, as society is calling for security to be re-thought by bringing it up to date through lasting, shareable, holistic and sustainable policies, as

demonstrated by the ecological security doctrine, for which there is a symbiosis between humans and nature.

Therefore, what is to be encouraged is the affirmation of urban models that recognise this link and are committed to reducing gas emissions, drawing up climate change prevention protocols, and are guided by a model of sustainable development that authorises the well-being and survival of the ecosystem and the species that inhabit it, achieving high standards not only of urban safety, but also of health, human, energy, food, water, and economic security.

Clearly, taking this vision of environmental and ecosystem security to a local scale also means thinking about governance and the active involvement of the population and other stakeholders. Engaging the public sector, the private one, and citizens create a partnership geared towards guaranteeing high levels of security that last over time. This security is also built based on urban design, which must change to reconcile the security of citizens and the environment (new services, goods, and spaces compatible with the concept of sustainable development, collective wellbeing, personal protection, liveability, and city appeal).

Thus, this paper recognises Smart Cities and Eco-Cities as urban models capable of ensuring urban sustainability, security, and a sense of safety, conditions in which the environment and population are healthy and can thrive. As a result, cities are easily and happily populated, sustainable, and inclusive thanks to the implementation of *avant-garde* policies.

To achieve this status, we cannot avoid the use of appropriate technologies, whose development and use can be oriented towards urban security and can honour citizens' safety. These two are reckoned as public goods linked to the decorum and liveability of the city environment and are attainable objectives by means of, to name a few, requalification, urban planning, social and cultural innovation, inclusion, information initiatives, recovery of degraded areas or sites, minimisation of marginality and social exclusion, crime prevention, promotion of education, respect for the legality, social cohesion, and civil coexistence.

The study revealed that Smart Cities and Eco-Cities are emerging as constructs that unite citizens, communities, businesses, technology, and institutions in a new pro-environment mindset that increasingly celebrates and recognises urban security in inclusive terms, that acknowledges the value of the urban community as a whole, and that respects the economy, society, and the environment, in line with the principles of sustainable development.

In these two urban models, security becomes a fundamental requirement for urban well-being, thus every measure and strategy aims to guarantee it without making any distinction between

environmental preservation, human profit, and wellbeing-driven needs. This attitude manifests a great sense of innovation.

The urban design and tools implemented in the public spaces of Smart Cities and Eco-Cities are meant to increase the city's defence capability from situations of destruction and attack, enhance hygienic conditions to alleviate health and pandemic disasters, build, position, or re-position in strategic locations police headquarters, firefighting facilities, and hospitals, minimise the use of natural resources and decarbonise energy use, improve the quality of air and food that come into direct contact with citizens, diminish health risks related to pollution, and make cities self-sufficient.

The analysis, divided into chapters, dealt with three different but related issues: urban security, Smart Cities, and Eco-Cities. The focus on urban security (the need for which is a direct result of forms of unease, social discomfort, and urban life) and the policies put in place to achieve it was the premise for understanding how the two urban models under consideration relate to this topic. Indeed, without understanding what is meant by urban security and without delving into its many nuances and applications, it would have been difficult to understand why we talk about cyber, food, water, health, energy, and human security.

Among these broad areas of security, which differ from each other, there are points of contact that have been studied in the local dimension. Indeed, urban insecurity does not only have to do with the risk of being victims of predatory attacks but is also linked to anti-social behaviours, environmental and infrastructural degradation, interpersonal relationships decay, marginalisation, poverty, unemployment, subjective (distorted) perception of crime, as well as the presence of an illegal marketplace dominated by the organised crime.

Bringing the security analysis back to the city setting simplifies the prevention, identification, application, and monitoring of security policies designed to reduce crime and conditions of insecurity, and this is where Smart Cities and Eco-Cities come into play as their innovations and their relationship with the urban design are considered in terms of their impact on security as they create social cohesion and collaboration, technological development, and facilitate the work of the police to the point of guaranteeing situational prevention procedures through the amelioration of video surveillance and public lighting, maintenance of public spaces, control of the territory by patrols and their immediate intervention; community prevention and inclusion strategies, such as the management of green public spaces, mutual trust, cooperation, and neighbourhood watch mechanisms; social mediation and prevention initiatives involving minors, the unemployed, ex-prisoners and the destitute.

Nevertheless, what emerged from the research is that as much as a city may equip itself with the most developed technologies or be committed to the most admirable sustainable practices, we will never achieve a satisfactory level of security without human capital. Therefore, in any urban model and under any regime of urban security policies – be they prevention, zero tolerance, or insecurity mitigation oriented – we will need to invest in training for citizens and public workers who will find themselves living and performing their duties in a context characterised by telematic procedures, cyber risks, technical language oriented towards sustainable development, and environmental transition.

Besides, in these two urban models, a substantial collaboration between national and local police forces is guaranteed, as well as the exchange of information between these two bodies, the identification of common standards, the territorial interconnection of workspaces, the regulation of the joint use of IT security systems for the control and mapping of the territory. Incentives for the promotion of awareness and prevention campaigns, coordinated urban inclusion and regeneration programmes, and continuous training opportunities for local and state police officers should also be mentioned.

The guiding thread of the thesis is the need to reverse the trend of climate change, degradation, and consequent vulnerabilities. This is possible with Smart Cities and Eco-Cities because they make clear the link between urban security policies and sustainability by giving rise to policies that are based on the heterogeneity of the territory in which they will be implemented (social, economic, cultural, political conditions, crime traits) and that guarantees the integration of different forms of technology, social practices, and skills as they create collaboration and synergy between police officers, citizens, and devices.

Additionally, it was also analysed how these urban paradigms embody the Urban Ecological Security approach, which considers that the success of any security policy at the urban level is due to a long-term perspective and the ability to act on several sectors (production, management, distribution of goods and resources) to achieve widespread social and economic well-being. Therefore, with the new practices and principles promoted by these urban paradigms, it is possible to anticipate systemically and prepare strategically for possible risks of resources' scarcity, use technical, scientific, and IT capabilities that can implement the principles of climate change mitigation, energy security, resource security, technological change, and the new priorities emerging from a local-centric economy.

To draw a conclusion, what can be said about Smart Cities is that the urban model, the lifestyle, and the usability of the services offered coincide with the goal of creating a safe, environmentally green, and efficient city, attractive to new generations in sustainable ways. Public

security is offered through smart strategies that relate to the integration of infrastructure, technological tools, public resource management, and people. Therefore, by integrating IoT and ICTs, and ensuring the fulfilment of a community's basic needs, Smart Cities provide safe conditions for community development and wellbeing.

The research found that certain urban planning and design strategies, combined with IoT and digital interconnections, supply an additional weapon to the many policies implemented by local authorities to combat insecurity on different levels.

Hence, Smart Cities and their technologies offer basic security functions such as detection, prevention, identification, authentication and defeat of urban threats, complementary security tools to enhance and strengthen traditional systems that perform urban security tasks, integrate more services and functions, and improve the smartness of the urban environment. Then, there are also technological tools that, unlike in the past, facilitate collaboration and interconnection between different work sectors, allowing for more immediate and easier communication and exchange of information, as well as the possibility of collecting data and building predictive models to truly implement the concept of urban and integrated security.

Smart Cities support the implementation of urban security in different ways. The IoT provides a more pervasive internet, but it also promotes better digital management of public assets, optimises the provision of public services, and ensures better surveillance. The pervasive control provided by cameras, sensors, GPS, and other tools typical of Smart Cities keeps social order under control and favours the fair course of justice, which in turn reduces the opportunities for violence, crime, and turmoil. The implementation of these technologies also has a positive effect on the monitoring of variables such as air, noise, and light pollution, injuries and traffic, and the salubrity of public and historical buildings.

The technology used and the ability to utilise it correctly mean that in a Smart City, urban security can also be guaranteed in terms of prevention, identification, and real-time intervention. Therefore, it can be argued that when the integrated use of technology is correctly performed, the benefits outweigh the costs of implementation, installation, maintenance, and staff training. In addition, ensuring urban safety in a Smart City does not mean demolishing an urban conglomerate to build new buildings. On the contrary, any city can, with the right care and investment, become "smart", and the same applies to green cities. Obviously, it should be stressed that the larger and denser the city, the more complex – but not impossible – it will be to ensure that it acquires these qualities.

In Smart Cities, however, the enjoyment of urban security can be jeopardised by intrinsic factors in the ICT used. Emerging problems include the digital divide and restricted or problematic accessibility for the digitally illiterate, security privacy, viruses and malware, big data leakages, the trustworthiness of sensors, apps, and internet, big data management, speed storage, and false information. Therefore, if the goal is to find an urban model that combines innovation, sustainability, security, and well-being, we must at least ensure that we are provided with the right means to protect ourselves from risks related to privacy, cybersecurity, and to interact safely in this space.

This is essential because, alongside the risks and more than legitimate concerns, this urban model offers significant benefits: digitisation increases transparency and makes citizens trust public powers, corruption tends to decrease because controls become more capillary, accessibility to data and services is widened, thus allowing a reduction in both marginalisation and discrimination, education itself is rethought with innovative techniques and integrated approaches that prepare young people to be conscientious citizens, the waste, food, water, and energy sector becomes integrated and more efficient thanks to infrastructural technological developments.

Regarding the analysis carried out on Eco-Cities and urban security, this model consists of high-tech autonomous systems that rely on renewable energy sources and do not produce emissions or harmful phenomena that could compromise the well-being of citizens and the ecosystem. The main objective is to minimise the human impact on the environment, so the urban design, infrastructures, and habits of the city are oriented towards stable and self-sustainable community thinking.

The city becomes a central and strategic place for the promotion of an eco-culture capable of ensuring high levels of systemic security. The research showed that in an increasingly globalised world where the harmful effects of climate change are putting security at risk, people and policymakers are beginning to follow the “think global, act local” paradigm, giving rise to new solutions and tactics that pursue sustainable development without jeopardising people’s security needs. The dimension of security was analysed from the point of view of food, water, and energy security, with reference to the way in which these areas interact with the health domain.

In terms of food security, these urban conglomerates facilitate food accessibility and quality by promoting urban gardens and spaces that can be cultivated by the community using techniques that do not exploit and spoil the soil, that do not use pesticides and harmful substances, and that reduce, rationalise, and optimise agricultural space. By making healthy food available, accessible and sustainable, food insecurity is drastically reduced, while health security is increased.

Promoting sustainable urban mobility, energy efficiency, and decarbonisation, air quality is improved, consequently ensuring better health. Public lighting provided by renewable energy sources has a positive impact on urban decency and safety, the use of smog-eating paints, the treatment, and reuse of rainwater for the irrigation of parks and urban gardens reduces the city's carbon footprint.

In the light of all the above considerations, it is possible to say that in a Smart City and Eco-City the technologies and strategies typical of these models translate into better public services, including the guarantee of safety, better use of resources, and less impact on the environment.

We can say that smart cities, by virtue of the technologies and interconnections they develop, tend to provide urban security in the more canonical and traditional sense. Eco-cities, on the other hand, with their strategies and values, contribute to guaranteeing a broader and more articulated urban security, which expresses in a broader plethora of sectors.

Summary

On the back of the assumption that the negative consequences of climate change jeopardise social, political, economic, and environmental balances, this thesis takes into consideration the sphere of security, believing that it is the cornerstone on which the community – local and global – must rely to implement the plethora of values deriving from the sustainable development paradigm.

Climate change compromises human, food, water, energy, environmental, health, and urban security, as these domains, although intrinsically different, influence and relate to each other in the perspective of causal dynamics. Therefore, recognising climate change as a factor that, combined with other variables, increases risks to the security of individuals, cities, and the ecosystem, it is necessary to move towards the development of forward-looking policies to decrease these vulnerabilities.

In order to be effective, these *avant-garde* public policies, which aim to solve a problem that generates unease in all sectors of social life, must be precisely calibrated according to the needs of the territory in which they will be implemented. Therefore, this thesis analyses the local dimension, as the author believes that a large-scale phenomenon such as climate change and its consequences on security can be managed more effectively if the scope of action is reduced to the urban scale.

Recognising cities as entities in perpetual transformation, capable of perceiving the needs of the community and translating them into concrete initiatives and services, they can be seen as drivers of change. Every local authority is called upon to take care of urban security, as well as the food, water, energy, health, human, and environmental one. Thus, it was possible to conduct an examination based on two innovative urban models and their initiatives through the lens of security.

The paper aims to show how Smart Cities and Eco-Cities are two urban paradigms that with their features and values contribute to increasing urban security by counteracting the pervasive insecurity arising from climate change and impacting on several fronts.

Indeed, these prototypes of cities of the future seek to achieve ecological and widespread security by lowering pollution and promoting a transition to low carbon economies, within a framework of human, environmental, and urban security.

It is inconceivable to achieve sustainable development or live in an environmentally sustainable way if we are not allowed to live in conditions of security in our cities. Additionally, this security and the deriving sense of safety have to be considered as prerequisites for implementing sustainability-oriented policies, and they must be understood in a comprehensive and integrated way:

it is not enough to merely enjoy individual physical security to reduce the carbon footprint, but to realise the concept of sustainable development, that is to meet the needs of the present generation without depriving future generations of the right to live and have their basic needs met, there is also the necessity for food security so that all people have the right amount of nutrients to fulfil their role in society, water security to meet individual and business needs, and energy security to ensure that risks are reduced pollution, and diseases resulting from the abuse of non-renewable and harmful energies can be ended and give way to renewable sources which in turn contribute, together with other sustainable habits, to health security, human security to protect the integrity, values, rights, and dignity of individuals, and widespread urban security.

The latter is understood, pursuant to Article 4 of *decreto legge 20 febbraio 2017, n. 14, "Disposizioni urgenti in materia di sicurezza delle città"*, converted into *legge 18 aprile 2017, n. 48*, as a public good concerning the liveability and decorum of the city. It can be pursued through a multitude of measures such as urban planning, redevelopment strategies, recovery of degraded areas, crime prevention, education, cultural integration, social cohesion, and civil coexistence.

From these considerations, it emerges that public security concerns activities and tasks attributed to the central state, local institutions, law enforcement agencies, and non-institutional subjects such as private companies, schools and universities, ordinary citizens, in line with the principles of vertical and horizontal subsidiarity, which favour the notions of integrated and participatory security.

These principles and practices are facilitated and extended in Smart Cities and Eco-Cities, which, through local decision making and implementation of new programs and guidelines mobilize social and political action on climate change, requiring new perspectives on security – especially urban security – that can be achieved through bottom-up and top-down responses centred on the re-design of cities in the logic of smartness and sustainability attitudes. They emphasize the sense of community belonging and offer pragmatic tools to actively contribute to security-related initiatives without resorting to coercive methods. Indeed, these two urban models make available new technologies and new logics of integration and connection between infrastructures and services to intervene in urban planning and coping strategies by emphasising the security dimension. Everything starts from the idea that security measures not only are fundamental in the establishment and maintenance of urban order, but they also respond to various needs such as healthcare, efficient logistic, contrasting crime, and monitoring the quality of the environment, thus acquiring the notion of "sustainable" investments and practices.

Indeed, securing streets and other urban areas, managing diversity, and reducing risks of social inequalities, as well as making city's areas perceived as safe through serious and innovative urban

planning activities, results in creating safe and inclusive zones that support individual and communitarian development, thus guaranteeing the overall flourishing of the community itself.

Both two models facilitate the appointment of urban security policies well rooted in the territory allowing local authorities in charge of security *(i)* to plan measures that positively affect the quality of life of urban space, *(ii)* contribute to its proper maintenance, *(iii)* manage territorial criticalities with a long-term perspective, *(iv)* counteract social alarmism, *(v)* promote urban planning choices that enhance and emphasize urban development, and *(vi)* orient, through urban police, trade, and decorum regulations, the behaviour of those who inhabit the urban environment to establish order. Nonetheless, local policies aiming to increase the safety and liveability of urban spaces must be accompanied by communication campaigns and strategies where the role of citizens is highly evaluated, as it is undeniable that civicism has significant effects on the quality of public space, and if it was genuinely practiced and promoted, many security interventions would not be necessary, as it would be the action of residents the means to counteract the onset of insecurity phenomena.

Smart Cities are known for their tendency towards the pervasive use of technology, the Internet of Things (IoT), interconnectivity, and the relevance of the online sphere over the offline one.

In this dissertation the concept of urban (in)security finds its place in the Smart Cities framework as any smart city embracing the road to urban development contemplates the issue of security, providing the competent authorities with the means at the cutting edge of technology to ensure the safety of all inhabitants.

With regard to urban security, even in Italy, as evidenced by regulatory texts and guidelines, the use of technological tools to view and monitor the territory is a strategy, both local and national, to increase security. Obviously, it is necessary to understand whether these tools will effectively be of help and instrumental in meeting the security needs of the urban space, and, therefore, if the costs of installation and maintenance will be outweighed by the benefits in terms of reduced incidence of criminal phenomena and increased sense of security perceived by the population. Nonetheless, it emerged that technological surveillance could have a positive impact on the liveability and safety of urban places only if it is integrated by other measures, be they prevention, urban rehabilitation and regeneration, maintenance of infrastructure, or enhancement of services.

Smart Cities enable the implementation of numerous strategies to increase urban security. To detect and avoid anomalies, threats, unlawful, and inappropriate behaviours, enforcement authorities can analyse facial expressions and lip movements through surveillance cameras, and Artificial, or use

GPS, location data, and fibre sensing networks. The real innovation does not derive from the presence of these tools, rather from the interconnection and the automatic intervention protocols that Smart Cities provide, thus immediately distinguishing between the several insecurity phenomena, activating a risk notification system, transmitting a warning to local police offices, and allowing prompt interventions. Targeted and real-time police intrusions are also complemented by the de-escalation of risky situations through "environmental" changes, as the parameters of public lighting can be altered by increasing the brightness, unexpected sounds can be emitted, or communications can be transmitted by the police station via loudspeakers, or the microphones incorporated in cameras and ordinary instruments such as traffic lights. Besides, once the risky event and all those involved have been identified, the task of identifying, tracking, and following become easier, allowing the threat to be contained and solved within a short time. Sensing networks are fundamental in monitoring structural and environmental parameters, fibreoptic sensors are used for perimeter protection, there are sensors able to detect sounds and identifying their source, intelligent video surveillance tools that recognise and predict abnormal situations based on movements and analysis of the objects on public land, radars that capture the image of intruders in public and private buildings through IoT-based security systems, video surveillance systems relying on networks of wirelessly connected sensors to rapidly share information to law enforcement authorities, and smart devices to detect harassments through GPS tracking, alarm, force sensors, and shock functions, not to mention the use of machine learning to monitor and detect fraudulent transactions. Naturally, for this type of security intervention to be as extensive and precise as possible on the urban ground, it is necessary to equip the city with a network of multiple intelligent devices.

The research also found that there is a significant number of areas where Smart Cities bring security-related benefits. The way in which Smart Cities technology can intervene to *(i)* facilitate city monitoring activities allow pervasive and ubiquitous computing techniques that extract key information from various devices and process it to simplify active control and ensure security, they foster *(ii)* e-government and smart governance, which give rise to transparency, thereby positive security implications, as citizens have access to public documents and procedures, thus supervising the public activity and requiring high levels of accountability, a key element to ensure efficiency and reduce corruption, *(iii)* the use of the urban IoT is a powerful means to perform several computations, create, and maintain an up-to-date database concerning the structural health of buildings and infrastructures, *(iv)* technology can be applied to monitoring air and water quality, and waste management, *(v)* traffic management, *(vi)* energy and public lighting, *(vii)* health, the offer of which is facilitated through smart devices, and *(viii)* education.

The huge security benefits and opportunities outlined in the thesis are achieved, however, at a cost.

Examining the technical characteristics of the tools used by a Smart City, it is already possible to foresee what are the potential risks, infiltrations, or misuses. Thus, it is imperative to be prepared to intervene and ensure tools' safe functioning. If there are weaknesses in interconnectivity that can be exploited by third parties for criminal purposes, the urban system risks being paralysed and falling victim to negative cascade events, also due to hardware limits, software restrictions, and hard-network requirements.

Furthermore, in the context of Smart Cities security, anything dealing with privacy and data flow management becomes important and requires special attention, which translates into the need to draft new laws that can protect individuals and measures in favour of privacy and cybersecurity to benefit from economic, environmental, social, and security gains. Strategies to secure information systems and protect privacy include encryption practices and protection against viruses affecting mobile phones, sensors, computers, and all other technological tools, as well as the commitment of decision-makers and local authorities to guarantee security for the key infrastructures and to require and perform specific security testing.

Sharing the assumption that societies grow if their living spaces permit development and progress, in this era it is indispensable to invest in sustainability and justice, also understood in social terms, to create strong, cohesive, resilient, and sustainable development-oriented communities able to contrast the exponentially growing damages caused by climate change. This is the case of Eco-Cities, a model that enucleates the values of sustainable development taking it at the urban level and creating new synergies between habits, infrastructures, production, consumption patterns, and security. The decision to invest locally is driven, as mentioned earlier in this paper, by the projected growth of the global population, which, either by birth or by relocation, will occupy cities rather than rural areas. In this scenario, the best way forward is to focus on creating spaces in which the community can live in human, social, and economic ease, peace, and safety, and where the energy sources are renewable, agricultural land is found on rooftops or indoor, and emissions of harmful substances are reduced to the minimum.

In the thesis, it was shown that Eco-Cities must dispose of the appropriate technologies and interconnections typical of a Smart City to ensure the proper functioning of key infrastructures that guarantee the use of primary goods and services. Among the numerous features of this urban concept and practice there is the fact that urban planning *(i)* safeguards the biodiversity, environment, food, and water-producing areas, *(ii)* encourages sustainable alternatives to car and motorcycle

transportation, *(iii)* relies on crossing edge technologies for water, food, energy, and waste management, *(iv)* creates buildings – especially public ones – robust and personalised for citizens' needs, *(v)* aims to maximise the economic and social performance of the city through innovation, sustainability, inclusion, equity, and safety that are pursued through inclusive, empowering, and democratic decision-making processes.

The urban management is responsible for guiding the city towards sustainable and safe practices, integrating the administration of water and energy resources to reduce GHGs, fostering the implementation of campaigns for recycling and proper waste disposal not to compromise the health of individuals and the soil, as well as facilitating the implementation of the circular economy, promoting social justice, and facilitating the maintenance of urban safety. Indeed, owing to a fair and equitable distribution of benefits, goods, and public services, conditions such as marginalisation, social tension, and poverty can be reduced, thus avoiding situations of discomfort that could lead to violence or crime.

The thesis considered how Eco-Cities relate to food, water, energy, and health security.

Eco-Cities support food security as they pose limits and offer new opportunities to agriculture. Indeed, they avoid the overexploitation of natural resources and pesticides to the extent that soil, groundwater, and green areas are endangered, thereby generating situations of environmental and personal insecurity. What the urban model of the Ecological City can offer is *(i)* the physical and legal protection of urban green spaces, *(ii)* the provision of incentives for growing food and the creation of urban farms, *(iii)* community awareness through projects that teach respect for the ecosystem, and *(iv)* involvement of city planners to create and set up forms of urban agriculture in the appropriate spaces of the city in the wake of theories such as system ecology and landscape ecology, as well as *(v)* promoting participation in political dialogue, so as to debate and deliberate on the future of the city and the safety and well-being of its inhabitants, *(vi)* an agroecological oriented analysis of public and private soil to strategically design food production, and *(vii)* implement climate-smart technologies to invest in water-smart practices like rainwater harvesting and micro-irrigation, in weather-smart activities, nutrient-smart practices such as precision fertilizers and site-specific nutrient management, as well as carbon and energy-smart practices,

Besides, the Eco-City also envisions the town as a place of food production, and it encourages the development of urban agriculture in different forms to implement the principle of space-efficient food production and security. Evidently, in the urban areas where the conditions for food security have not yet been realised, it is important to ensure that public authorities intervene to confirm that the right technologies and spaces are made available to people.

These Eco-Cities are also geared towards ensuring the well-being and security of their inhabitants. Therefore, ensuring a healthy diet is linked to incentives for sustainable mobility and urban design strategies to regulate city temperatures by avoiding the disruptive problem of urban heat and its consequences on human health.

The impact that this urban model has in relation to water security can be seen in the strategies it promotes to ensure that the city takes advantage of the natural conformation and resources of the territory, adapts to the urban agglomeration, and does not disfigure it with its infrastructure, and uses the most advanced technologies to increase the efficiency of the services offered to improve urban welfare in economic, social, environmental and satisfaction terms.

Concerning energy security, Eco-Cities tend to facilitate energy transition and decarbonisation by relying heavily on renewable energy sources such as solar photovoltaic panels, wind, and hydropower. Above all, the use of the IoT can optimise the storage, supply, and consumption of energy, reducing or avoiding waste.

Concluding, the thesis recognised Smart Cities and Eco-Cities as urban models capable of ensuring urban sustainability and security, intended as conditions in which the environment and population are healthy and can thrive. Nevertheless, what emerged from the research is that as much as a city may equip itself with the most developed technologies or be committed to the most admirable sustainable practices, we will never achieve a satisfactory level of security without human capital. Therefore, in any urban model and under any regime of urban security policies – be they prevention, zero tolerance, or insecurity mitigation oriented – we will need to invest in training for citizens and public workers who will find themselves living and performing their duties in a context characterised by telematic procedures, cyber risks, technical language oriented towards sustainable development, and environmental transition.

Smart Cities and Eco-Cities make clear the link between urban security policies and sustainability by giving rise to policies that are based on the heterogeneity of the territory in which they will be implemented (social, economic, cultural, political conditions, crime traits) and that guarantees the integration of different forms of technology, social practices, and skills as they create collaboration and synergy between police officers, citizens, and devices.

In light of all the above considerations, it is possible to say that in a Smart City and Eco-City the technologies and strategies typical of these models translate into better public services, including the guarantee of security and safety, better use of resources, and less impact on the environment.

We can say that smart cities, under the technologies and interconnections they develop, tend to provide urban security in the more canonical and traditional sense. Eco-cities, on the other hand, with their strategies and values, contribute to guaranteeing a broader and more articulated form of urban security, which expresses in a broader plethora of sectors.

References

Adger, W. N., Pulhin, J. M., Barnett, J., Dabelko, G. D., Hovelsrud, G. K., Levy, M., ... & Vogel, C. H. (2014). *Allocation.* IFC, Carbon Trust.

Antonelli Vincenzo, (2018) "La sicurezza delle città tra diritti ed amministrazione", Padova, Cedam.

ANTONELLI, V. L'esperienza dei "patti per la sicurezza" nel triennio 2007-2009.

Arabzadeh, V., Mikkola, J., Jasiūnas, J., & Lund, P. D. (2020). Deep decarbonization of urban energy systems through renewable energy and sector-coupling flexibility strategies. *Journal of environmental management*, *260*, 110090.

Armao, F. (2013). Smart resilience. Alla ricerca di un nuovo modello di sicurezza urbana.

Armitage, R., & Gamman, L. (2009). Sustainability via security: A new look. *Built Environment*, *35*(3), 297-301.

Associazione Italiana per la Sicurezza Informatica. (March 5, 2020). Number of cyberattacks reported to the Italian CERT (Computer Emergency Response Team) in 2019, by attack method [Graph]. In Statista.

Baratta, A. (2001) Diritto alla sicurezza o sicurezza dei diritti? in Anastasia S., Palma M. (2001), La bilancia e la misura, FrancoAngeli, Milano, 19-36.

Barba, C. T., Mateos, M. A., Soto, P. R., Mezher, A. M., & Igartua, M. A. (2012). Smart city for VANETs using warning messages, traffic statistics and intelligent traffic lights. Paper presented at the 2012 IEEE Intelligent Vehicles Symposium.

Becker, P. (2011). Understanding dependencies: why safety, security and sustainability are increasingly challenging for cities and regions. *Training Regions Professional Papers*, *1*(1), 1-6.

Berry, E. M., Dernini, S., Burlingame, B., Meybeck, A., & Conforti, P. (2015). Food security and sustainability: can one exist without the other?. *Public health nutrition*, *18*(13), 2293-2302, page 2295.

Bourmpos, M., Argyris, A., & Syvridis, D. (2014). Smart city surveillance through low-cost fiber sensors in metropolitan optical networks. Fiber and Integrated Optics, 33(3), 205-223.

Braccesi, C. (2016). Sicurezza urbana: il fenomeno, le politiche, i progetti. Forum italiano per la sicurezza urbana.

Bugliarello, G. (2006). Urban sustainability: Dilemmas, challenges and paradigms. *Technology in society*, *28*(1-2), 19-26.

Busby, J. W. (2007). *Climate change and national security*. Council on Foreign Relations.

Cagliero, L., Cerquitelli, T., Chiusano, S., Garino, P., Nardone, M., Pralio, B., & Venturini, L. (2015). Monitoring the citizens' perception on urban security in Smart City environments. Paper presented at the 2015 31st IEEE International Conference on Data Engineering Workshops.

Cai, K., & Wang, J. (2009). *Urban design based on public safety—Discussion on safety-based urban design*. Frontiers of Architecture and Civil Engineering in China, *3*(2), 219-227.

Calaresu, M., & Tebaldi, M. (2015). Local security policies and the protection of territory: an analysis of the Italian experience (2007-2009). *City, territory and architecture*, *2*(1), 1-18.

Campbell, B. M., Vermeulen, S. J., Aggarwal, P. K., Corner-Dolloff, C., Girvetz, E., Loboguerrero, A. M., ... & Wollenberg, E. (2016). Reducing risks to food security from climate change. *Global Food Security*, *11*, 34-43.

Cazzola, F., Ruggeri, F., & Coluccia, A. (Eds.). (2004). *La sicurezza come sfida sociale*. F. Angeli.

Corry, O. (2014). From defense to resilience: Environmental security beyond neo-liberalism. *International political sociology*, *8*(3), 256-274.

Crowe, T. (2000). Crime prevention through environmental design. Butterworth-Heinemann, 46.

Decreto legge 20 febbraio 2017, n. 14, "Disposizioni urgenti in materia di sicurezza delle città", converted into *legge 18 aprile 2017, n. 48.*

Decreto ministeriale 5 agosto 2008.

Doxa. (February 23, 2017). For which functionality do you use the smart devices connected in your home? [Graph]. In Statista.

Duffy, B., Wake, R., Burrows, T., & Bremner, P. (2008). Closing the gaps–crime and public perceptions. *International Review of Law, Computers & Technology*, *22*(1-2), 17-44.

Eckersley, R. (1992). *Environmentalism and political theory: Toward an ecocentric approach*. Suny Press.

Eigenbrod, C., & Gruda, N. (2015). Urban vegetable for food security in cities. A review. *Agronomy for Sustainable Development*, *35*(2), 483-498.

Elnokaly, A., & Elseragy, A. (2017, June). Eco-cities: strategies of rebuilding communities for resilient and sustainable development in Egypt with particular emphasis on Aswan. In *Proceedings of the International Conference on Changing Cities III: Spatial, Design, Landscape & Socio-Economic dimensions*. EG Press.

Energy & Strategy Group. (September 30, 2016). Share of smart technologies deployed in the field of public lighting in Italy from 2015 to 2020 [Graph]. In Statista.

European Committee for the Prevention of Torture and of Inhuman or Degrading Treatment or Punishment, March 2019.

Ferranti, P. (2016). Food Sustainability, Security, and Effects of Global Change. Reference module in food science. Elsevier. https://doi.org/10.1016/B978-0-08-100596-5.03445-4.

Ferraris, V. (2019). Comprendere la legalità e la sicurezza.

Food and Agriculture Organization of the United Nations (1983) World Food Security: A Reappraisal of the Concepts and Approaches. Director General's Report. Rome: FAO.

Food and Agriculture Organization of the United Nations (1996) Rome Declaration on Food Security and World Food Summit Plan of Action. Rome: FAO.

Food and Agriculture Organization of the United Nations (2002) The State of Food Insecurity in the World 2001. Rome: FAO.

Gallo Nicola, Nobili Gian Guido, Ricifari Emanuele 8a cura di) (2019), La sicurezza delle città, Milano Angeli.

Geissdoerfer, M., Savaget, P., Bocken, N. M., & Hultink, E. J. (2017). The Circular Economy–A new sustainability paradigm?. *Journal of cleaner production*, *143*, 757-768.

Giddens, A. (2003). *Introduction: neoprogressivism: a new agenda for social democracy*. The progressive manifesto: New ideas for the centre-left, 1-34.

Giupponi, T. (2019). Il "pacchetto sicurezza" e i rinnovati poteri del sindaco in materia di sicurezza urbana in Nobili, G. G., Giupponi, T., Ricifari, E., & Gallo, N. (Eds.). (2019). La sicurezza delle città: La sicurezza urbana e integrata. FrancoAngeli.

Giupponi, T. F. (2017). Sicurezza integrata e sicurezza urbana nel decreto legge n. 14/2017. *Istituzioni del federalismo: rivista di studi giuridici e politici*, (1), 5-29.

Giupponi, T. F. (2017). Sicurezza integrata e sicurezza urbana nel decreto legge n. 14/2017. *Istituzioni del federalismo: rivista di studi giuridici e politici*, (1), page 14.

Global Market Insights. (June 15, 2020). Global digital health market size in 2019 and a forecast for 2026 (in billion U.S. dollars) [Graph]. In Statista.

H. Girardet, Cities People Planet: Liveable Cities for a Sustainable World 6 (Chichester: John Wiley & Sons, Incorporated, 2004).

Habibzadeh, H., Kaptan, C., Soyata, T., Kantarci, B., & Boukerche, A. (2019). Smart city system design: a comprehensive study of the application and data planes. ACM Computing Surveys (CSUR), 52(2), 1-38.

Hillier, B., & Sahbaz, O. (2008). An evidence-based approach to crime and urban design, or, can we have vitality, sustainability and security all at once. *Bartlett School of Graduates Studies University College London*, 1-28.

Hills, A. (2005). Insidious environments: creeping dependencies and urban vulnerabilities. *Journal of Contingencies and Crisis Management*, *13*(1), 12-20.

Hodson, M., & Marvin, S. (2009). 'Urban ecological security': a new urban paradigm?. *International Journal of Urban and Regional Research*, *33*(1), 193-215.

Hoekstra, A. Y., Buurman, J., & Van Ginkel, K. C. (2018). Urban water security: A review. *Environmental research letters*, *13*(5), 053002.

Hope, T. (2017). *How to Measure the Effectiveness of Community Crime Prevention*. Center of Excellence in statistical information on government, crime, victimization and justice. A project by UNODC.

IHME, & Health Effects Institute. (October 21, 2020). Number of deaths attributable to air pollution in 1990 and 2019, by region [Graph]. In Statista.

Ijaz, S., Shah, M. A., Khan, A., & Ahmed, M. (2016). Smart cities: A survey on security concerns. *International Journal of Advanced Computer Science and Applications*, *7*(2), 612-625, page 616.

IPCC, 2018: Annex I: Glossary [Matthews, J.B.R. (ed.)]. In: *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-

Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)].

IPCC, Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: *Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.

IPCC. (2014). Change, I. C. (2014). Mitigation of climate change. *Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, *1454*. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.

Italian Constitution.

Jacquier, C. (2008). Urban Governance: forging a path between complications and complexity. *Towards New Territorial Governance*. Paper presented at the symposium ‘‘Towards New Territorial Governance’’, Reims, France.

Jha, Abhas K., Todd W. Miner, and Zuzana Stanton-Geddes, eds. 2013. Building Urban Resilience: Principles, Tools, and Practice. Directions in Development. Washington, DC: World Bank. doi:10.1596/978-0-8213-8865-5. License: Creative Commons Attribution CC BY 3.0.

Johan Galtung, (1969). *Violence, peace and peace research*. Journal of Peace Research, 6, 167–191.

Kaplan, S. (2009). Identity in Fragile States: Social cohesion and state building. *Development*, *52*(4), 466-472.

Koh, K. L., Gunawansa, A., & Bhullar, L. (2010). " Eco-Cities" and" Sustainable Cities"-Whither?. *Social Space*, 84-92.

Kompas, T., Pham, V. H., & Che, T. N. (2018). The effects of climate change on GDP by country and the global economic gains from complying with the Paris climate accord. *Earth’s Future*, *6*(8), 1153-1173.

Langille, H. P. (2016). Sustainable Common Security. *Mondial, Canada: World Federalists*.

Laufs, J., Borrion, H., & Bradford, B. (2020). Security and the smart city: A systematic review. *Sustainable cities and society*, *55*, 102023.

Leibowicz, B. D., Lanham, C. M., Brozynski, M. T., Vázquez-Canteli, J. R., Castejón, N. C., & Nagy, Z. (2018). Optimal decarbonization pathways for urban residential building energy services. *Applied energy*, *230*, 1311-1325.

Lindemann-Matthies, P., Brieger, H., 2016. Does urban gardening increase aesthetic quality of urban areas? A case study from Germany. Urban For. Urban Green. https:// doi.org/10.1016/j.ufug.2016.03.010.

McDonald, M. (2018). Climate change and security: Towards ecological security. *IT*, *10*, 153.

McDonald, M. (2018). Climate change and security: Towards ecological security. *IT*, *10*, 153.

Mercer. (2011). *Climate Change Scenarios – Implications for Strategic Asset*

Moore, M. H. (2013). *Recognizing public value*. Harvard University Press.

Moraci, F., & Fazia, C. (2013). Smart Cities and challenges of sustainability. *TeMA Journal of Land Use, Mobility and Environment*, *6*(1), 35-45.

Mougeot LJA (2000) Urban agriculture: definition, presence, potentials and risks. In: Bakker N, Dubbeling M, Gündel S, Sabel-Koschella U, de Zeeuw H (eds) Growing cities. Growing Food. Dtsch Stift int Entw, Feldafing, pp 1–41.

Mylrea, M. (2017). Smart energy-internet-of-things opportunities require smart treatment of legal, privacy and cybersecurity challenges. *The Journal of World Energy Law & Business*, *10*(2), 147-158.

Nik, V. M., Perera, A. T. D., & Chen, D. (2021). Towards climate resilient urban energy systems: a review. *National Science Review*, *8*(3), nwaa134.

O'Brien, K., & Barnett, J. (2013). Global environmental change and human security. *Annual Review of Environment and Resources*, *38*, 373-391.

OECD. (2012). *OECD Environmental Outlook to 2050.* Paris: OECD Publishing.

Osservatori Digital Innovation. (April 7, 2020). Main barriers to implementation of smart city projects in Italy in 2018 and 2019 [Graph]. In Statista.

Osservatori Digital Innovation. (April 7, 2020). Market value of Internet of Things in Italy from 2016 to 2019, by field of application (in million euros) [Graph]. In Statista.

Osservatori Digital Innovation. (April 7, 2020). Municipalities' interest in projects for making cities smarter in Italy in 2019, by area [Graph]. In Statista.

Osservatori Digital Innovation. (April 9, 2020). Investment priorities in cybersecurity and data protection in Italy in 2019, by field [Graph]. In Statista.

Osservatori Digital Innovation. (February 3, 2021). Breakdown of cybersecurity expenditure in Italy in 2020, by solution type [Graph]. In Statista.

Osservatorio Attacchi Digitali. (February 18, 2020). Main types of cyberattacks in Italy in 2018 [Graph]. In Statista.

Pachapur, P. K., Pachapur, V. L., Brar, S. K., Galvez, R., Le Bihan, Y., & Surampalli, R. Y. (2020). Food Security and Sustainability. *Sustainability: Fundamentals and Applications*, 357-374, page 367.

PAVARINI M. (1998): "Introduzione" a "La Sicurezza nelle Città", in "La sicurezza in Emilia Romagna", Quarto rapporto annuale 1998, in "Quaderni di città sicure", 1998, 14.

Pinstrup-Andersen, P. and Pandya-Lorch, R. (1998). Food security and sustainable use of natural resources: a 2020 vision. Ecological Economics 26 (1): 1–10.

Pirages, D., & Cousins, K. (2008). *From Resource Scarcity to Ecological Security Exploring New Limits to Growth*. Academic Foundation.

Porter, J.R., Xie, L., Challinor, A.J., Cochrane, K., Howden, M., Iqbal, M.M., Lobell, D.B., Travasso, M.I., 2014. Chapter 7. Food Security and Food Production Systems. Climate Change 2014: Impacts, Adaptation and Vulnerability. Working Group II Contribution to the IPCC 5th Assessment Report, Geneva, Switzerland.

Reddy, A. G., Suresh, D., Phaneendra, K., Shin, J. S., & Odelu, V. (2018a). Provably secure pseudo-identity based device authentication for smart cities environment. Sustainable cities and society, 41, 878-885.

Report of the United Nations Conference on Environment and Development, Rio de Janeiro.

Report of the World Commission on Environment and Development: Our Common Future, 1987.

Rose, N. (1999). *Powers of freedom: Reframing political thought*. Cambridge university press, page 251.

Rudskaya, E. N., Eremenko, I. A., & Yuryeva, V. V. (2019, December). Eco-cities in the paradigm of a circular economy and a comprehensive internet. In *IOP Conference Series: Materials Science and Engineering* (Vol. 698, No. 7, p. 077023). IOP Publishing.

S. Dirks, C. Gurdgiev, and M. Keeling, “Smarter cities for smarter growth: How cities can optimize their systems for the talent-based economy,” IBM Institute for Business Value, 2010.

Sacher, D., & Windfuhr, M. (2008). The debate on “water as a human right” and its implications for development assistance. In *Water Politics and Development Cooperation* (pp. 146-176). Springer, Berlin, Heidelberg.

Sánchez-Corcuera, R., Nuñez-Marcos, A., Sesma-Solance, J., Bilbao-Jayo, A., Mulero, R., Zulaika, U., ... & Almeida, A. (2019). Smart cities survey: Technologies, application domains and challenges for the cities of the future. *International Journal of Distributed Sensor Networks*, *15*(6).

Savoldelli, A., Misuraca, G., & Codagnone, C. (2013). Measuring the Public value of e-Government: The eGEP2. 0 model. *Electronic Journal of e-Government*, *11*(1), 373-388.

Schilling, J. (2012). *On rains, raids and relations: a multimethod approach to climate change, vulnerability, adaptation and violent conflict in northern Africa and Kenya* (Doctoral dissertation, Universität Hamburg Hamburg).

Schuppert, F. (2005) ‘*The Ensuring State’*, in A. Giddens (ed.) The Progressive Manifesto: New Ideas for the Centre Left, pp. 54–72. Cambridge: Polity Press.

Selmini, R. (2014). Origine, sviluppo ed esiti delle politiche di governo locale della criminalità nell’Italia contemporanea in Corradini, F. (2014). Dalla città all’Europa. Strategie di sicurezza urbana, Edizioni Nuova Prohmos.

Smith, D., & Vivekananda, J. (2007). *A climate of conflict: The links between climate change, peace and war*. International Alert.

Smith, D., & Vivekananda, J. (2009). Climate change, conflict and fragility. *International Alert, London*.

Steffen, W., Grinevald, J., Crutzen, P., & McNeill, J. (2011). The Anthropocene: conceptual and historical perspectives. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, *369*(1938), 842-867.

Tacoli, C. (2013). Urban poverty, food security and climate change. *IIED Briefing Paper-International Institute for Environment and Development*, (17149).

The OECD Programme on Smart Cities and Inclusive Growth - OECD. (2020).

Transforma Insights. (December 22, 2020). Internet of Things (IoT) total annual revenue worldwide from 2019 to 2030 (in billion U.S. dollars), [Graph]. In Statista.

Transforma Insights. (December 22, 2020). Internet of Things (IoT) annual revenue worldwide from 2019 to 2030, by use case (in billion U.S. dollars), [Graph]. In Statista.

Tremblay, R. C., Nikolenyi, C., & Otmar, L. (2003). Peace and conflict: Alternative strategies of governance and conflict resolution. *Journal of Comparative Policy Analysis: Research and Practice*, *5*(2-3), 125-148.

UNEP Post-Tsunami Recovery Activities 2004-2007 document.

UN-HABITAT (2009), Planning Sustainable Cities – Global Report on Human Settlements 2009, 113.

United Nations (1975) Report of the World Food Conference, Rome, 5–16 November 1974. New York: UN.

United Nations, (2017). New Urban Agenda, ISBN: 978-92-1-132757-1.

Università degli Studi di Roma "La Sapienza". (March 5, 2020). Distribution of phishing attacks in Italy in 2019, by affected sector [Graph]. In Statista.

Van Heek, J., Aming, K., & Ziefle, M. (2016). "How fear of crime affects needs for privacy & safety": Acceptance of surveillance technologies in smart cities. Paper presented at the Smart Cities and Green ICT Systems (SMARTGREENS).

Vanolo, A., 2014. Smartmentality. Urban Stud. 51 (5), 883–898.

Velazquez, M., Kounadi, O., & Podor, A. (2020). Analysis and mapping of crime perception: A quantitative approach of sketch maps. *AGILE: GIScience Series*, *1*, 1-18.

Wood, E. (1961). Housing design: A social theory. Ekistics, 12(74), 383-392.

World Bank (2009) Eco2 Cities: Ecological Cities as Economic Cities Program, http://preview.tinyurl.com/ecocitiesfullreport.

World Health Organization. (2020). The state of food security and nutrition in the world 2020: transforming food systems for affordable healthy diets *(Vol. 2020). Food & Agriculture Org.*

Yang, K., Zhang, K., Ren, J., & Shen, X. (2015). Security and privacy in mobile crowdsourcing networks: challenges and opportunities. IEEE communications magazine, 53(8), 75-81.

Yigitcanlar, T. (2016). *Technology and the city: Systems, applications and implications*. Routledge.

Zanella, A., Bui, N., Castellani, A., Vangelista, L., & Zorzi, M. (2014). Internet of things for smart cities. *IEEE Internet of Things journal*, *1*(1), 22-32.

Zedner, L. (2000). The pursuit of security. *Crime, risk and insecurity: Law and order in everyday life and political discourse*, 200-214.